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Environmental Governance of Coasts

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Shaw, J. R. 2008. Coastal planning and conservation: what next for Victoria's eastern coastline? Proceedings of Conserv-Vision Conference. The University of Waikato. New Zealand.

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Abstract

The problem of managing Australia's coasts has been a focus of concern for at least the past three decades. The Australian Government's *State of the Environment Report* in 2011 recognised that "our coasts, as well as being some of the our most iconic natural areas, are some of Australia's most heavily settled areas," but noted continued environmental degradation and decreasing environmental sustainability of coastal regions, where "'business as usual' is likely to lead to undesirable outcomes for coast." This thesis utilises the emerging field of environmental governance as a lens to examine progress in environmental management of the coast.

Environmental governance has dealt with processes of efficiency, effectiveness, institutional arrangements, social justice and capacity building, but much of this literature focuses on process and lacks an outcome and performance orientation. A review of the environmental governance literature drawing on natural resource management, ecology, management theory, politics and international law, was undertaken. This review, highlighting specifically Driessen et al's insights that environmental governance includes "all kinds of measure deliberately taken to prevent, reduce and/or mitigate harmful effects on the environment" and "the means by which society determines and acts on goals related to the management of the environment" identified key criteria of environmental governance. These criteria were considered to provide a robust base to a framework of analysis to apply to empirical examples to assess achievement of environmental management goals. These criteria are: environmental objectives in strategic planning, spatial links to ecological techniques, thresholds and feedback loops, advocacy, and knowledge management. The empirical focus of research centres on three selected case studies of natural resource management in coastal areas of Victoria, Australia. The case studies of terrestrial (wetlands) and freshwater management (environmental flows) are generally neglected in coastal management that tends to focus on littoral or marine issues. A third case study of marine protected areas encompasses both coastal and marine areas. These cases studies; freshwater environmental flows, coastal wetlands management, and marine protected areas are government programs interacting with community and other actors. While there are constraints in analysis from a limited number of case studies that cover a large, but not all, area of

Victoria's coastal zone, these data can, however, provide important insights in outcome focused environmental governance. Analysis of the cases showed that environmental objectives in strategic planning, spatial links to ecological techniques, advocacy and knowledge management were found to be major contributors to achievement of environmental management goals in each of the case studies with thresholds and monitoring, the criterion least subscribed to in the three case studies. The extended period of time taken to get spatial components allocated to the environment has contributed to this. These processes took well over 20 years, lowering the immediate importance of thresholds and monitoring. Recent emphasis has been on monitoring, definition of ecological character and resilience. At a micro scale, the research also highlighted that objectives developed outside of government, the importance of science, paid advocacy and including knowledge suitable for the general public contribute to achieving progress in environmental governance.

This lengthy time period to achieve key goals in all three case studies is a major finding. This is most notable in terms of environmental flows (27 years), and marine reserves (24 years). It was found that is was impossible to move quickly on environmental objectives, given the impact of institutional arrangements, and management structures, the need for research and agreement on science techniques, as well as gaining broad community support. In addition it was noted that extremely lengthy implementation periods made the development of thresholds and feedback loops extremely unlikely. Advocacy that was paid or resourced from government was a critical factor, as was compensation. It was found that science was extremely important in the negotiations for the environment and that the "hard yards" of negotiating with key user groups were unavoidable. Knowledge management pointed to the critical nature of providing information in forms that the public can understand including the terms that were used and the descriptions that they could relate to. Existing property rights and land tenure contributed to the lengthy time to achieve performance along with getting the public and others to understand the issues involved. Analysis of the case study data also enabled a checklist for environmental governance to be developed. This evolution in environmental governance is a substantial step to assist performance.

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Introduction

The management and governance of Australia's coasts is recognised as one of the most persistent challenges facing successive Australian governments. Nearly 50 years of debate and study has occurred, with considerable attention given to the conflict between uses of the coast and the long-term sustainability of an extremely valuable resource to Australia. This conflict began with concerns over coastal engineering solutions to storms in the 1960s and 1970s, soil conservation, and moved to sustainability, degradation of the coast and the lack of integration between Commonwealth, State and local governments in the 1990s (House of Representatives Standing Committee on Environment 1991, Boak et al 2001, Harvey and Caton 2010, Haward 1994). One constant challenge persists - the conflict between people's desire to live on the coast and the environmental sustainability of these ecosystems.

Environmental sustainability is only one of many considerations required to govern the various pressures on the coast. While other coastal uses and users are dependent on its condition, the environment has value in its own right. In its 2005 statement, the Millennium Ecosystem Assessment stated "The overriding conclusion of this assessment is that it lies within the power of human societies to ease the strains we are putting on the natural services of the planet, while continuing to use them to bring better living standards to all" (Millennium Ecosystem Assessment Board 2005b), 23). Therefore multiple value sets exist in the management of the coasts. Acceptance that the environment is an explicit consideration in governance of the coast can be seen in sustainability definitions but may not be translated into environmental services or discrete environmental performance.

Objectives and Aims

The primary objective of this thesis is to contribute to greater understanding of the factors driving decision-making affecting the environmental governance of coastal areas and unpack performance related to the environment in these habitats. In improving understanding of the factors shaping governance of the coast it is more likely that the value of retaining some areas and environments in a condition with minimum human impacts, or at least the implications of this, will be understood.

This call for greater transparency is clearly in line with the recent State of the Environment Report which states; " Few people with a stake in Australia's coasts want to see environments and other assets decline" State of the Environment Committee 2011, 885).

This thesis aims to:

1. Explore the utility of the concept of environmental governance.
2. Examine key requirements of environmental governance in relation to achievement of management goals.
3. Evaluate past and current efforts to manage Australia's coasts against identified key criteria of environmental governance.

These aims drive two broad research questions:

1) What are the key requirements of environmental governance? and
2) How can these key requirements be applied to coastal management?

Addressing these questions to case examples provides opportunities to explore how environmental governance was undertaken, in particular the extent to which significant learning, study and resources have been applied. Environmental governance in this form consists of institutional arrangements, and the rules and processes associated with decisions on natural resources. The decision relevant to this thesis is the amount of the resource allocated to the environment versus the amount for other uses as determined in case examples of environmental governance. These decisions are linked to ecological models that focus on the determination of the amount of degradation and impact related to the amount of the resource utilized. This thesis argues that lessons can be learnt from wetland and freshwater governance structures, especially the resource management learning, and can be logically applied to coastal governance since natural resource planning of the marine environment has received less attention than the more visible terrestrial and freshwater environments. Two case studies in natural resource management have been chosen from freshwater (environmental flows) and terrestrial (wetlands). Additionally taking a further third case study of (Marine Protected Areas) covering coastal and marine environments, allows further comparisons to be made.

Victoria is a densely populated region of Australia and has examples of the most extreme settlement versus conservation issues in the Australian continent. Learning from professionals and others that have dealt with this development level is relevant to the advancement of environmental governance in Australia. These particular case studies were chosen because they cover the major conservation and geographical areas in Victoria. The three separate case studies have institutions that deal with these issues that exhibit distinctively different organisational cultures and histories against a common background of geographic factors and state politics. The rationale is that there may be lessons to learn from the different approaches in these distinctive organisational cultures and investigation of the presence or absence of criteria across all three case studies.

Significance of this research

There has been a considerable amount of work undertaken in Australia to address issues of coastal zone management. Over 20 reports within a period of two decades, including the report *The Injured Coastline* have assessed and pointed to issues of conservation of the coast of Australia (House of Representatives Standing Committee on Environment 1991, Haward 1995). While a broad range of recommendations have been developed, coastal zone management problems, in particular environmental degradation, still persist. In addition, extensive ecological studies and other forms of scientific information gathering and research do not appear to be producing environmental results to the extent that researchers and managers anticipated in the 1980s and 1990s. "The 2006 State of the Environment report concluded that 'most, if not all, of the issues identified and assessed in both the 1996 and the 2001 national state of the environment reports still remain to be resolved"' (State of the Environment Report Committee, 2011, 851).

The significance of this research is summarised in the following points that will be expanded in later sections.

- The value of the coast as a sustainable entity and the possible contribution of environmental governance to assist conservation.

- The problem of environmental issues, conservation and sustainability of the coast of Australia remains unanswered to date, with a lot of resources and reports attempting to answer questions of process. Part of this dilemma is that this problem straddles three tiers of government, with responsibilities for coastal management at all these levels. Therefore this is a costly problem for these three levels and without coordination may mean extensive government costs without results. This research addresses this coordination issue by simplifying the key performance drivers required for environmental governance to provide clarity.
- Management that does not achieve a result for the environment, or limited results, does not appear to be a good investment for the public. Science and other reports do not appear to be translated into action and decisions taken on the environment may be watered down over time (State of the Environment Committee 2011, 873, Wells 2003, 1222). Taking environmental governance to a performance or outcome level, this research examines this problem.
- Environmental problems of the coast appear likely to exponentially increase with population, sea change and climate change effects and solutions are being called for (State of the Environment Committee 2011, 885).
- Increasingly public concern with environmental quality with little facility for public input to governance processes (Delmas and Young 2009). Therefore any investigation of environmental governance that provides a solution to this dilemma is worthwhile.

The congruence and linking of scientific research with other key factors for success of conservation of the coast is reported as requiring both improvement in the collection and use of information (State of the Environmental Report 2011, 873, Wells 2003, 1222). It appears that part of the problem of not achieving conservation and sustainability objectives is that linkages between critical factors and time needed to ensure implementation are not being made. It is these linkages that are at the center of environmental governance.

The House of Representatives Standing Committee on Climate, Change, Water, Environment, and the Arts concluded in 2009 "a priority to address these concerns was to encourage research on alternative approaches to governance" (House of Representatives Standing Committee on Climate, Change, Water, Environment, and the Arts, 2009; State of the Environmental Report 2011, 873).

Scope

This research focuses on the environmental management of Australia's coasts. The area defined as the coast includes the coastal catchments and is seen in the definition below. The coastal catchments will have a great effect on the environmental status of the coast as seen above with the effects on sedimentation from cleared catchments (Zann 1995, State of the Environment Committee 2011). For the purposes of this thesis, the definition of the Victorian coast used by the Victorian Coastal Strategy 2002 will be used. This defines the Victorian Coast as including the sea and the seabed to the State limit of three nautical miles or 5.5 kilometers; and land and inland waters within the coastal catchment. The coastal zone therefore includes:

- land and waters on the seaward side of coastal watersheds
- the sea and seabed to the state limit (generally three nautical miles from the high water mark) (Victorian Coastal Council, 2002).

Recognising that governance may also include legislation, this thesis concentrates on management and the designation of solutions and recommendations that would then lead to the drafting instructions required for new legislation. It does not deal with a detailed analysis of current legislation relating to environmental governance. Where it is recognized that both recent droughts and future climate change affect environmental goals, a detailed analysis of these factors is beyond the scope of this thesis.

Definitions

The definition of governance that is used in this thesis is based on the following referred to by Kullenberg (2008) as given by Elisabeth Mann Borgese (1918- 2002) "Coastal and ocean governance may be defined as the processes and institutions by

which coastal and ocean areas are managed by public authorities, in association with communities, industries, NGOs' and other stakeholders" (Kullenberg 2008, 11). Therefore governance can be seen as a combination of legal statute and management. Dealing with natural resource management, we see that due to the conflict of multi users, we have government, communities and private industry involved.

This thesis is focused on the environmental component of this governance. Based on the definition of Ngar (2007) for coastal and ocean governance, the term environmental governance is used in this thesis to mean the processes and institutions by which areas are managed by public authorities and private individuals **for the environment**, in association with communities, industries, NGOs' and other stakeholders. Environmental governance has now entered a broader discourse. Delmas and Young (2009) look at governance as "a social function centered on efforts to steer societies or human groups away from collectively undesirable outcomes (e.g., the tragedy of the commons) and towards socially desirable outcomes (e.g. the maintenance of a benign climate system)"(Young 2009, 12).

Driessen et al (2012) refer to "environmental governance" as "the means by which society determines and acts on goals related to the management of the environment. It includes instruments, rules and processes that lead to decisions and implementation." An increasing emphasis has been placed on the combination of the components in the definition of "environmental governance" that I am choosing to use for this thesis (Driessen et al 2012, 2).

Research Design and Methods

This project involved a qualitative analysis multiple methods approach utilising a combination of primary and secondary data. Worldwide analysis of the research examining the factors and principles likely to affect the achievement of environmental goals was undertaken. The literature examined included management, conservation biology, governance, natural resource management, environmental governance, public administration, ecological theory, integrated public land management, international law, social-ecological theory and public policy to determine the fundamental principles and criteria for achieving environmental goals.

This research design uses a structured limited comparative case study methodology of case studies within a 'most similar' systems approach (Roberts 1978) using a structured focused comparison (George 1979). As Roberts notes "where the problem is one of identifying and accounting for specific differences, selection of units of analysis which possess many similarities in terms of relevant variables makes easier the identification of variables which do differ" (Roberts 1978: 293 original emphasis). This approach helps establish a series of case studies – as Sartori (1991) commented "comparison and case studies can well be mutually reinforcing and complementary undertakings" (Sartori 1991, 252) – reiterating the point that Eckstein (1975) made that "case studies are first and foremost part and parcel of theory-building" (Sartori 1991, 252).

The value of comparative research is illustrated by May (2001) in comparative accounts of five western-style societies and limits to market-based policies as "Comparisons which revel difference and diversity and, in the above example, cultural impediments to the implementation of policy enable us to consider the macro factors which influence social and political change and the micro factors which influence social and political change and the micro factors peculiar to each social setting" (May 2001, 209). This consideration of macro and micro factors from comparative case studies is used to effect in this thesis.

In-depth interviews were held with twenty-six key interviewees covering each of the empirically focused case studies and more general areas of environmental planning, coastal policy and natural resource management. A table of the spread of these interviews across the three case studies and the positions of interviewees is given in Appendix 2. Of the twenty-six interviewees, six were either agency heads or had been an agency head at some time in their career. Four interviewees were senior public servants, three held positions as scientists and two were professional advocates. The numbers of interviewees for each case study was approximately the same with a slightly higher number for the environmental water case study. In all case studies the interviewees were a mixture of position types as can be seen in Appendix 2. A preliminary list of key interviewees was drawn up based on the interviewee's public statements and publications, as well as formal policy responsibilities. Consideration was given to the three necessary conditions;

accessibility, cognition and motivation; for successful completion of interviews (Kahn and Cannell 1983 in May 2001, Moser and Kalton 1983 in May 2001). A comparative snowball approach was used to identify further key informants.

A guided, semi-structured interview questionnaire was developed to ensure comparability of case studies (see Appendix 1). The method of semi-structured interviews allowed the interviewee to give material that was more around their own terms than if a structured interview technique had been used. Open-ended questions permitted respondents to amplify issues and add information, leading to additional questions to be asked and answered to inform analysis of the policy formulation process. The structure underpinning the questions designed around the key elements of environmental governance allowed for comparability across and between interviews.

These interviews were undertaken under University of Tasmania's Social Science Human Research Ethics Committee approval (project number H0011260) and subject to reporting under University of Tasmania's Guidelines for Research Using Human Subjects. Interviewees were de-identified and given an alpha-numeric code (for example Interviewee WT55671) when data was included in the thesis. Interview transcripts were analysed using the NVivo 9 computer software package designed for helping analysis of non-quantitative data sets (QSR International Pty Ltd 2014). This software enabled key variables to be identified and is an invaluable means of assessing detailed transcripts. The flags used in the NVivo analysis were key words from the interview questions. The design of questions enabled coding of these key words allowing classification of the responses in "analysable and meaningful categories" (May 2001). This interview technique also draws on social research theory, and its value "in informing actions" rather than discovering social facts (May 2001).

Content analysis of key documents was also utilised. The scope of documents analysed was deliberately broad and included – government reports and policy statements, management plans and ministerial statements, parliamentary debates, committee of inquiry reports and media reports. Non-government organisations reports and other sources of grey literature were also examined. As May has noted

"criticisms of documentary research tend to stem from how documents are used, as opposed to their use in the first place" (May 2001, 197). It is for this reason that these data were collated and linked with data gained from interviews as an integrated research methodology as part of a multiple methods approach.

Limitations with this methodology are that the twenty-six interviews undertaken could be seen as inadequate to substantiate the case study. The range of positions chosen over the case study, the prominence of heads of agency and the use of documents and grey material to substantiate the evidence provided checks against this.

A Review of Australian coastal Management

Australia possesses the world's longest ice-free coastline, and a large maritime jurisdiction area, some 18.5 million square kilometres (more than twice the size of its land mass), with concomitant management and policy-making challenges (Haward and Vince 2009; Westcott, 2006). The diversity and range of interests in the coastal zone as well as the involvement of different governments have important implications for coastal governance. The size of Australia's coastal and marine jurisdiction means a core governance issue remains one of resourcing and managing a range of different sectors. On one hand active management for conservation and parks requires significant human and financial resourcing, on the other remote, undeveloped and uninhabited areas of the coast may be important areas in conservation terms.

The lack of integration between levels of government, and constraints on public input into decision-making, have been detailed in different reports on the coast over the past thirty years. The State of the Environment Report 2011 points to efforts that are poorly coordinated within jurisdiction and only weakly harmonised with national approach. "Limited federal leadership" is also noted, especially in the area of degradation of marine and coastal biodiversity and their protection from threats (State of the Environment Committee 2011, 442).

Australia's coasts have been subject to environmental change and degradation despite considerable effort being expended in coastal management at state and local government levels. This has raised questions of effectiveness of this management

(State of the Environment Committee 2011, 442). The State of the Environment Report 2011 states "There is continued loss of biodiversity, duplication of effort, inefficiencies, an overall lack of effectiveness, and distrust among the sectors, the various jurisdictions and the community. This issue has been raised as a high priority by every national State of the Environment report, and by many authoritative reviews and commissions over decades. A vertically and horizontally integrated national system for marine conservation and management is widely seen as a critical gap in management" (State of the Environment Committee 2011, 442).

In addition to these failures and limitations in environmental governance for coasts, the effects of urbanisation, population, regional growth, catchment management and climate change also impact such approaches. These factors are major influences on coastal environments.

Recent issues of climate change have bought about their own emerging governance structures. The National Taskforce on Climate Change for Australia was formed in 2004 and has a brief to provide support and guidance to coastal councils and local government areas on matters of climate change (Stokes and Faulkner 2011). A recent survey of local government employees on needed climate change actions to be undertaken by state and national bodies, revealed the foremost priority as new state policy, followed by new national policy (Stokes and Faulkner 2011, 25).

Harvey and Caton (2010) refer to two major components with regard to governance of Australia's coasts

- Policy and Legislation
- Integrated Coastal Management

Policy and legislation

Policy and legislation have concentrated on resource use, and managing environmental processes and areas, including coastal catchments. At the federal level many reports have been commissioned following concerns about the management, integration of sector impacts, sustainability and environmental degradation of the coast (HORSCEC 1980, House of Representatives Standing Committee on Environment 1991, Resource Assessment Commission 1992). For instance the

Coastal Zone Inquiry (1982) included under "matters to be considered" the impacts of development in the coastal zone (Resource Assessment Commission 1992, vii).

Harvey and Caton note that the concept of sustainable development was publicised through the report *Our Common Future* (also known as the Brundtland Report) from the World Commission on Environment and Development (WCED), (Harvey and Caton, 2010, 4). In this report sustainable development was defined as "that which meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987, 8). *Our Common Future* pointed to the world's population and associated development and the issues that this raised in beginning to exceed the global ecological mechanisms to support this (Gurran et al 2011 in Stokes and Faulkner 2011, 15). Sustainable development was addressed at the key United Nations Conference on Environment and Development (Earth Summit) in 1992. One outcome of this conference was the non-binding plan titled Agenda 21. A complete chapter (chapter 17) of Agenda 21 was devoted to the management of the coast and its environment. The non-binding nature of Agenda 21 has served as guide or action plan working at all levels across national, state and local components (Svensson et al 2008, Howard and Hawkins 2009).

At the same time these global focused initiatives were developed, a series of reports highlighted the need for sustainable development of the coasts, and improved coastal management across three layers of government in Australia. The Resource Assessment Commission Coastal Zone Inquiry released in late 1993, in particular, referred to the need for a " systematic and nationally integrated approach to the management of the oceans and coasts" (Harvey and Caton 2010, 11). In 1998, Australia released a national Oceans Policy as major commitment to the International Year of the Ocean. Australia's Oceans Policy received favorable international attention and formed a framework for establishing regional, later bioregional, marine plans (Haward and Vince 2009, 7, Vince 2005, 2006). The Oceans Policy did not apply to state waters, has seen sectors with well-developed solutions continuing to act individually despite this holistic policy and did not address coastal issues. Australia's Oceans Policy reflected constitutional issues affecting offshore

jurisdiction. As this thesis only addresses the coast to three nautical miles from the low water mark Australia's Oceans Policy is for the most part outside the scope of this thesis. The Oceans Policy did, however provide a focus on key interests and responsibilities.

The States have their own coastal policies that apply to their area of jurisdiction including waters three nautical miles offshore. Examples of these state policies are the Tasmanian Coastal Policy 1996, NSW Coastal Policy 1997, the Victorian Coastal Strategy 2008 and the draft Victorian Coastal Strategy 2013 (The Department of Primary Industries Water and Environment Tasmania 1996, NSW government 1997, Victorian Government 2008, Victorian Coastal Council 2013).

Integrated Coastal Management

The principle planning method for Australia's coastline is Integrated Coastal Zone Management (ICZM), which was introduced into Australia following its adoption as part of Agenda 21, at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. ICZM seeks to integrate the planning and management of the coastal environment to produce a holistic plan for a coastal area (Cicin-Sain and Knecht 1998). In practice this involves the integration of planning and management by the coordination of activities of the various government agencies and nongovernment organisations in the coastal zone, including the National, State and local government levels (Victorian Coastal Council, 2002). Despite longstanding and widespread support for systematic and nationally integrated approach for management of the oceans and the coasts these reviews note little progress has been made (Environment. Australia 1998b, a, Resource Assessment Commission 1993, State of the Environment Committee 2011, 435).

Value of the coast

Many scientists and policy professionals have emphasized the value of Australia's coast and commonly refer to the large percentage of the population that resides on the coast of Australia and the concentration of economic activity that occurs as a consequence (Haward and Vince 2009). Others, like the State of the Marine Environment Report (SOMER) for Australia evaluation of the coast in 1996, point out the extremely high value of the marine environment of Australia (Victorian Coastal Council 2002). The value of the coast as a tourism destination and the number of visitors frequenting the Australian coast is also a common reference in the literature (Zann 1996).

Economic analyses, using a variety of analytic methods (e.g., travel cost methods, contingent valuation method) put a dollar value on the non-market components of the coast, including amenity, recreation and intrinsic values. This has resulted in considerable estimates of economic value attributed to the coast, with different studies costing a range of amenity from the value of surfing trips to the value of additional access to the beach and car parking (Lie 2008). In Australia the importance of the coast as a living destination makes it a valuable resource, with over 85% of the population living within 50 kilometers of the coast in 2001 (ABS 2004 in Gurran et al 2007).

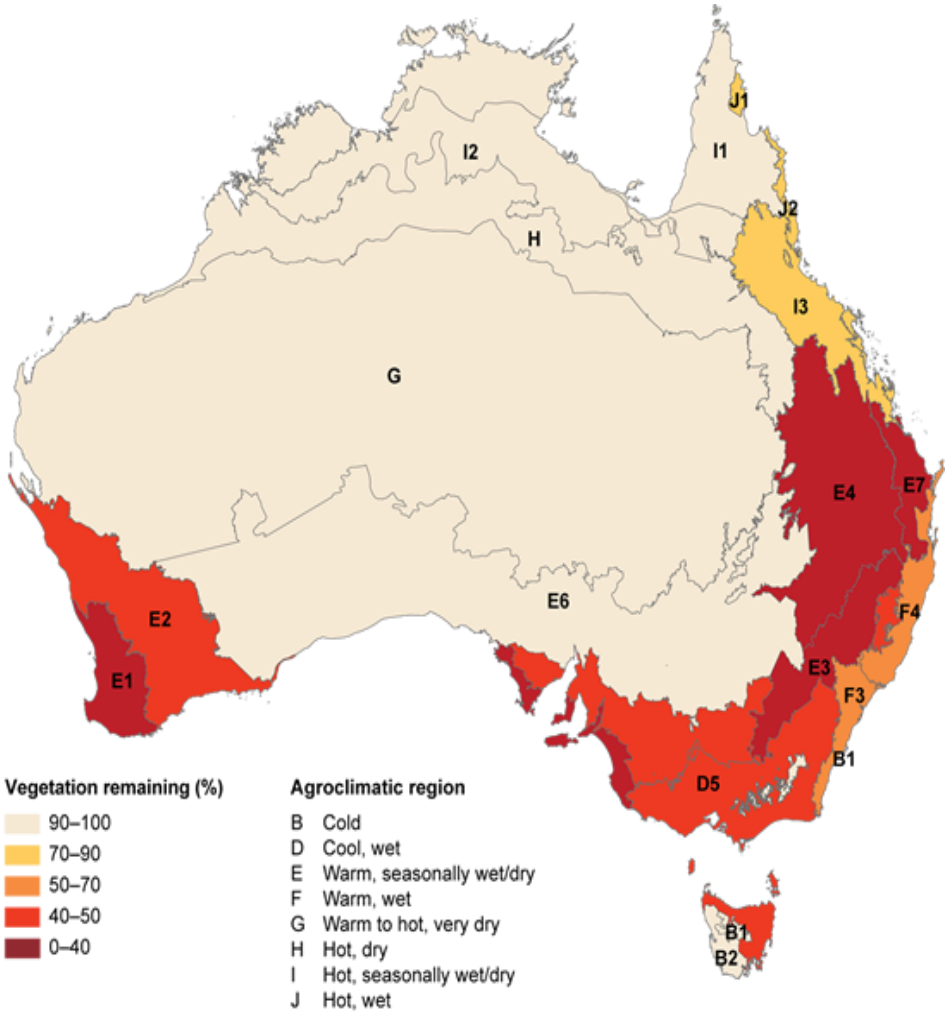
Australian is not alone in the value placed on the country's coastal regions, with over half of the worlds' population reported to live and work in the coastal zone (Harvey and Caton 2010). Commitment to solving issues arising from competing uses is globally apparent. The Global Ocean and Coastal conference in Vietnam in 2008, with representatives from countries with a wide range of socio economic indices, emphasised the value of coasts and oceans as a food resource, a place to live and valuable habitat supporting ecosystem services. In particular, countries highly value fisheries that depend on the coastal zone to sustain human populations (Lie 2008, 67).

The value of the coast needs also to take account of the ecosystem services that coastal areas provide. Costanza et al (1997), for example, emphasise the value of environmental services to mankind from the marine and coastal areas. A total value of between $16 to 54 trillion is given as the annual value of ecosystem services from 16 global biomes, including marine and coastal components (Wescott 2000). The coast provides habitat, nursery grounds for species, and food sources associated with primary production – seagrass beds, mangrove communities and kelp forests; (Fabbri 1998, Lie 2008). Coastal areas have high productivity because of land based nutrient sources and mixing of nutrients from the deeper water (Meyneckea et al 2008).

The 2011 Australian State of the Environment Report is the most current report giving an overview of the environmental condition of Australia's coasts. Although the marine components of the coast are listed as in overall good condition, the local coastal areas are reported as having major pressures (State of the Environment Committee 2011, 844). Many areas of the coast are in poor or very poor environmental condition, including some of the worst examples of pollution in the world (State of the Environment Committee 2011, 466).

The State of the Environment Report 2011 clearly points out the impacts of extensive development of coastal regions and other encroachments on habitat. Even though quality habitat appears to exist now in coastal regions, these areas are in danger of "blinking out" of some species. The condition of localised extinction that can occur as a result can be illustrated using the indicator of hooded plovers. This species has an approximate life span of 10 to 12 years, but without recruitment the population will decline and eventually disappears from the location. If we continue to use such species as an indicator we may not be alerted to a problem with the environment for 10 to 12 years, at which time it may be too late (Eric Woehler per com). One key variable that can be used as an indicator of environmental health is the percentage of remaining native vegetation (Shaw et al 1986, Shaw 2008, State of the Environment Committee 2011, 858). Figure 1 illustrates the impact on pre-1750 native vegetation in close proximity to the coast.

Figure 1 **Percentage of Australian Native vegetation remaining, by agroclimatic region.**



Source: State of the Environment Committee 2011, 311

Key: Letters indicate agroclimatic categories: numbers indicate subcategories for each region (Hutchinson et al. 2005, State of the Environment Committee 2011, 311).

A large percentage of the coastal area of Australia has less than 50% of native vegetation remaining. The majority of Victoria's coastline has between 40% and

50% remaining native vegetation and the majority of NSW's coastline has between 51% to 70% remaining native vegetation (State of the Environment Committee 2011, 859). It is now common for adults to remember playing in wild places and acknowledge that these experiences are no longer available along the coast, mainly due to increasing urbanisation, resulting from "in-filling", creation of larger homes on smaller land plots and a great reduction in outdoor space (Harvey and Caton 2010, 137, State of the Environment Committee 2011, 868). Incremental development is a feature with the State of the Environment Report 2011 reporting difficulty in assessing the cumulative impact on abundance, diversity and amount of remaining pre-European vegetation (State of the Environment Committee 2011, 858).

Sand dunes are another physical component of the coast, making up a significant component of the coastal environment, which are directly affected by increasing use of the coastal strip. Harvey and Caton (2010) report these areas as subjected to a massive impact across Australia's coasts, mostly as a result of building, mining and grazing. Harvey and Caton (2010, 74) state, "it can be said that there are few coastal areas that remain in a pristine state." Burning, the introduction of non-native, pest plants and animals and the clearing of native vegetation are also listed by Harvey and Caton (2010) as causes of sand dune decline.

The state of Australia's estuaries is also in contention, especially those situated on the south–eastern side of Australia, near to cities and consisting of lakes in the southwest (State of the Environment Committee 2011, 396). The State of the Environment 2011 found ecosystem health of some estuaries and marine near-shore waters was poor with the south–east of Australia under particular pressures (State of the Environment Committee 2011, 396). Serious further degradation is expected in these areas over the next 50 years with the appearance of algal blooms that now occur regularly (State of the Environment Committee 2011, 396). "Severe damage" is the status given to several estuaries on the east coast by the State of the Marine Environment Report 1995 with causes listed as sedimentation from cleared catchments, development, transport and recreation. Increased damage occurs where most people live, with coastal strip development impacting heavily on estuaries and the State of the Environment report (2011) referring to some instances of irreversible

damage (State of the Environment Committee 2011, 440).

Zann (1995) reported 64% of the estuaries in NSW and 2% of the estuaries in Victoria as suffering from poor water quality, largely as a result of cleared catchments. Zann considered that "more than 60 % of estuaries in the south-east of the continent have suffered major modification" (Harvey and Caton 2010). In 2011 concern was still being raised over estuary conditions with observations made that some estuarine systems needed significant action to restore environmental quality (State of the Environment Committee 2011, 440).

Wetland management remains an important issue in the coastal zone. Loss of wetland and coastal estuary areas is steady at a 60% loss with some continued incremental loss (Millennium Ecosystem Assessment 2005a). The remaining wetlands and estuaries has resulted in a series of polices and programs at both the federal and state level in Australia. Changes in wetland programs over time have resulted in different levels of protection with a general community awareness of the value of these areas. Despite this awareness, housing development continues to encroach on these areas and conflicts emerge. Estuaries in NSW for instance are impacted to the level of 50% having double the natural levels of sediment and nutrient inputs. This is highly related to clearing of natural vegetation catchments of more than 50% (State of the Environment Committee 2011).

A key indicator of health of the marine environment is the area of seagrass retained. Beds of seagrass tend to grow in shallow seawaters and are key primary producers in the marine environment (State of the Environment Committee 2011). They have many dependent marine fishes and invertebrates (Zann 1995). Vegetarian sea mammals, like the dugong *Dugong dugon* in Australia, are completely dependent on seagrass for food and habitat (Campbell 2000). Seagrass is also known to significantly cut down the amount of tidal movement and is linked to the amount of sedimentation of marine areas (Grech 2009).

The seagrass beds in Australia are highly significant because Australia has the highest biodiversity of seagrasses in the world. Australia also has the largest area of temperate seagrass in the world along with a large area of tropical seagrass

comparable on the world stage (Heiss et al 2000). Seagrass studies have been conducted in many countries with concerns at the loss of seagrass beds (Zann 1995). Dieback of seagrass beds are reported in the 1995 State of the Marine Environment Report in all parts of the coast of Australia, and seagrass beds are definitely more impacted near to cities (Campbell 2000).

The die-back of seagrass in Westernport Bay in Victoria, is estimated is be 85 per cent (Harvey and Caton 2010). Effects of draining swamps and wetlands, notably the draining of the Koo Wee Rup swamp in the Westernport catchment has vastly affected Westernport Bay, increasing sediment loads and decreasing size and quality of seagrass beds. Six areas in NSWs where seagrasses used to occur widely are now proposing to have seagrasses declared as an endangered species (State of the Environment Committee 2011, 391).

Australia also has some of the most exceptional reef areas in the world with the Great Barrier Reef as a classic example, recognised as the largest system of coral reefs in Australia (Ojeda-Matinez 2009). The environmental status of the Great Barrier Reef remains controversial with different opinions on the potential effects of invasive species and the known effects from catchment runoff associated with land-use changes. Of more recent development has been the potential for climate change to impact on the reef either directly through increased ocean warming, sea-level rise, and ocean acidification or indirectly through increased storm severity and frequency resulting in higher land-sourced runoff (Hockings and Gilligan 2009, Wooldridge 2009, Wooldridge et al 2012, Butler et al 2013, Evans et al 2013, Haward et al 2013).

Priority Coastal and Ocean Issues – Australia

The environmental status of Australia's coasts described above is affected by and impacted by a number of drivers and pressures in the coastal zone, including:

- Population increases, which has flow on effects to many of the priority issues below
- Development and building

- Runoff and other non-point sources of pollution (including addition of nutrients)
- Point-source Pollution
- Loss of vegetation/habitat
- Tourism
- Recreation pressures
- Desalination
- Fishing
- Oil and gas developments
- Introduced species.

Among these issues for coastal management, non-point sources of pollution remains in the high impact category. Clearing river and coastal catchments in Australia has had a very significant impact on water quality (Harvey and Caton 2010). The removal of a extensive amounts of vegetation in the two and a quarter centuries of European settlement has meant coastal erosion and associated impacts including sediment and nutrient runoff from land which has damaging effects inshore areas in particular on coral reefs (such as those forming the Great Barrier Reef). The impact of an increase in the built environment, facilities, transport routes and recreation can be seen as multi-level effects with firstly the loss of vegetation and habitat, and subsequent issues such as the loss of biodiversity, increase in urban runoff and the creation of diffuse sources of pollution (Harvey and Caton 2010).

Other primary impacts on the coast include an increase in development, runoff from urban catchments, development and maintenance of port infrastructure and pollution. As reported by Roy et al (2001), southeast Australia has a coastal zone with massive urban development, canal developments, high-rises and international resorts. Harvey and Caton (2010) use the term "suburbanisation" to describe the gradual change from holiday type areas to filling in open spaces with houses, and the development of a suburb on the coastal edge with all the services of a suburb environment of the city. This has affected natural coastal processes such as the natural opening of lagoons, seagrasses and algal processes (Roy et al 2001). As well as conservation values that are affected, recreation is also impaired as "suburbanisation" increases (Port Phillip and Westernport Catchment Management Authority 2004). Recreation activities on

the coast range from jet skis, boating to spear fishing and collecting from the inter-tidal zone. International tourists are known to undertake activities at the beach, including swimming, surfing, scuba diving and snorkelling (Harvey and Caton 2010).

Marine conservation is central to coastal management. The nutrient state of much of Australia's marine waters is less than other parts of the world and has low productivity and low fisheries production, especially on the east coast (Rochford, 1979, Roy et al 2001, Harvey and Caton 2010). There are a number of issues of concern in Australia, competition for fish stocks between recreation and commercial fishers, fishing pressure depleting of stocks, illegal fishing in northern Australian waters (Vince 2006), conservation of key species such as sharks (Harvey and Caton 2010) and knowledge gaps over key fishing species (Syms 2011, 6). Beeton (2006) and SOE 2006 have suggested pressures on fisheries in Australia primarily fro

m fishing pressure and climate change (Syms 2011).

Tourism is a major coastal use and with consequent impacts yet has been seen as the "sleeper" issue in coastal management for Australia (Shaw 2008). Over 3 million international tourists come to Australia each year, the great majority include a visit to coastal locations (Harvey and Caton 2010). Coastal areas in the immediate vicinity of major cities are especially prone to large influxes of visitors. High influxes of seasonal visitors as well as an overall increase in numbers of people have had effects on infrastructure as well as the coastal environment. Sewage treatment, water and energy demands, as well as recreation interests of the visitors are serious issues for coastal Australia. Tourism has been reported as the number one export industry of Australia with a reported $16 billion of income per year in the 1990s (New South Wales Department of Environment Climate Change and Water 2009).

Emergence of sea change and climate change and their impacts on Australia's coast

Large impacts on coastal communities have been observed as a result of "sea change" shifts, the movement of urban-based dwellers to country, and in particular to coastal environments, over the last ten years. Gurran et al 2007 notes a "tidal wave" in movement of people to the coast in Australia for predominantly life-style reasons, resulting in targeting attractive, often environmentally sensitive, coastal areas. As a consequence of these desires coupled with increased expendable income, the number of secondary homes has continued to rise, particularly in the "sea change" regions. A major problem with this phenomenon is that the governance arrangements of local councils, typically structured for the occasional visitor, are now faced with "highly demanding residents with urban demands" (Gurran et al 2007).

In addition to "sea change" effects, climate change impacts on southeastern Australia show a rise in temperature of 1 to 2 per cent. Changes to rainfall and more importantly runoff are noted to be vastly different and place pressures on water resources already stretched by a naturally variable climate. Global and regional scale climate change impacts will in turn affect local environments. Environmental systems and the ecological services they provide are likely to be affected and result in instability of systems that will need to be taken into account in coastal and marine planning. "The need for ongoing, rigorous accounting of adaptation therefore remains urgent" (Thompson et al 2006, 1). Impacts of sea-level rise and the more intense but variable storm surges will affect management and have influence on future environmental governance. Uncertainty related to climate change will have broad effects, from high level planning to small every day actions in homes, towns, coasts and littoral zones.

Shaw (2008) observed a low uptake of climate change issues in strategic planning documents for the coast in Australia. Other research has also observed early work in governance but little substantial planning (Nursey-Bray and Shaw 2009, Gurran et al 2007). Planning documents in Australia only recently incorporated limits on building in low lying areas that could be subjected to up to 1 metre rises in sea level, yet these decisions have been challenged and in some cases overturned.

The extreme environment of the coast, with its wetting and drying cycles and tidal influencers, has a great deal of variability and unpredictability about the physical environment. This is similar to the environment for freshwater in Australia, known to have one of the most variable rainfalls in the world. Recent work on saltmarshes in Australia show clear effect of climate change and sea level rise and indicate significant and recordable changes to saltmarshes (Harvey and Caton 2010). This work is consistent with findings overseas (Prahalad et al 2011). The coastal environment also has the characteristics of both water and land and the complexity of where these two environments meet. It may be that other conservation and environmental governance structures, set up largely by conservation programs and environmental management, offer something to this question of optimum environmental governance.

Outline of thesis

Following this general overview and definition of environmental governance and review of the status of the environment of the coast, **Chapter One** develops a new framework for analysis of environmental governance in relation to achievement of environmental management goals. This framework is an original piece of work devised to deal with the complexity, both structural and geographic, of environmental governance. The following **Chapters Two** to **Four** are case studies of environmental programs and actions. **Chapter Five** is a summary analysis of the case studies and the opportunities and challenges for coastal management in Australia. This leads to conclusions in **Chapter Six** on key elements of environmental governance and how they can be applied to Australian coasts with the elaboration of an environmental governance checklist. This checklist is result of synthesize of the material in earlier chapters, including **Chapter Five** and a response after the review of coastal management and policy in **Chapter Five**. The checklist is also a response to the opportunities and challenges for coastal management in Australia discussed in **Chapter Five**.

Chapter One

Environmental Governance and Coastal Management – Developing a Framework of Analysis.

This chapter examines the concept of environmental governance, drawing first on the broader concept of governance before examining the development of the literature on environmental governance in more detail. This material provides a foundation for a framework of analysis based on this concept of governance that can address environmental management of Australia's coasts and can solidly stand to solve some of the complexities of environmental governance.

1.1 Governance: The Concept

Governance has been defined as the "set of rules to steer" (Kjaer 2004, 3) and encompasses processes and institutions for the public good. It is a broader concept than "management" and thus opens up opportunities to explore a range of approaches and tools. Governance has increased in popularity as a discussion topic in academia. In particular, a large increase in the number of articles on governance has been noted in the period from 1999 to 2002 compared to the previous 12 years (Kjaer 2004). A recent Google Scholar search noted over 2 million hits on the term (Scholar Google 2013).

The attraction of the concept of governance is not just in its definition of a set of rules to steer the exercise of power and keep the rules on track, but also its definition of encompassing the world outside of government (Rhodes 1997 in Driessen et al). Rhodes (1977) noted that governance was "governing without government" – identifying a range of arrangements – for example market-based instruments or community based action that "governed' without clear direction from "governments". Governance in one sense emerged from the Government failure or overload literature. The crisis in governing that occurred in the post-Keynesian economic crises of the 1970s and 1980s, when inefficient government structures and processes were overturned and market-based approaches introduced (Head, 2011). While the results of such neo-liberal approaches are mixed, the focus on governance has had broader application.

As Haward and Vince (2009) have noted "government" is, however, a key actor – setting rules and arenas for market/economic instruments and community action (Haward and Vince 2009). Originally a concept linked to the work of government; actors, processes and networks outside of government are now widely recognised as included in governance (Driessen et al 2012). Ladeur (2004) also notes that governance is more than government and included identifying transnational networks of relationships as governance (Ladeur 2004). Examples of such relationships may include the World Trade Organisation (WTO), the International Monetary Fund (IMF) and the World Bank (Ladeur 2004). These international organisations are also key promoters of contemporary governance as part of broader based reforms.

Kjaer (2004) suggests that the overall objective of governance is either efficiency or effectiveness (Kjaer 2004, 48). Other researchers suggest characteristics of good governance are transparency, impartiality and carrying out matters in an accountable manner (democracy) subject to resource constraints (World Bank, 2000a: Kjaer 2004, 48). Traditionally these characteristics would be applied to institutions such as public agencies pursuing public good. The aim would be "to guide societies toward collectively beneficial outcomes and away from outcomes that are collectively harmful"(Kjaer 2004, 48).

An attractive characteristic of governance is the inclusion of settling conflicts over rules and the analysis of processes. Analyses of processes, with the opportunity to reflect on the performance of governance over time (and their possible success or failure) allow assessment of potential improvements (Hyden 1999, 185 in Kjaer 2004). Some of this analysis may include the identification of the rules governing access to power, and how they change, as well as the individuals and groups who implement the changes. These individuals and groups may be civil-society groups, political elites, or representatives of international organizations (Kjaer 2004).

There has been debate in governance circles about what areas are included in the academic discussion on governance. Much of the initial literature on governance emerged from the disciplines of political science and public administration, highlighting public administration reform, the resolution of global problems and international relations (Kjaer 2004). It is also worth noting that these concepts of governance grew out of a focus on institutions and institutional change (Kjaer 2004).

1.2 Environmental Governance

The concept of governance began to be applied to the environment in the mid to late 1990s. This work gave particular reference to planetary stewardship and the central idea that "governance can sometimes be accomplished, up to a point without governments" (Speth and Haas 2006). As noted in the Introduction, the definition of environmental governance used in this thesis is defined as "the means by which society determines and acts on goals related to the management of the environment. It includes instruments, rules and processes that lead to decisions and implementation" (Driessen et al 2012, 2). Environmental governance encompasses and consists of "all kinds of measure deliberately taken to prevent, reduce, and/or mitigate harmful effects on the environment" (Driessen et al 2012, 2) or "environmental governance refers to the processes of decision-making involved in the control and management of the environment and natural resources" (Fakier et al 2005, 4). The use of the term environmental governance has become much more popular in the last decade (Driessen et al 2012).

Taking the shifts in modes and processes, environmental governance has been able to take into account the changes from government to more participatory approaches with the public and partnerships with private enterprise (Driessen et al 2012). Traditionally, prior to the focus on environmental governance, the environment was restricted to analysis by programs and natural resource management. Figuring out what was working or not working for the environment was therefore restricted to narrow possibilities that did not easily explain the complex interaction by and influence of non-governmental stakeholders or the private sector.

Features of environmental governance are a focus on:

- The environment
- Processes, organisations and institutions
- Actors including non-governmental stakeholders and the private sector.

In short environmental governance can:

- Include both government and non-government structures
- Address collective action dilemmas

- Focus on processes over time
- Deal with more than institutions and institutional change
- Build on public administration theory which has now been expanded through governance theory to include other players and actors
- Include “all kinds of measures” (Driessen et al 2012).

Environmental governance is a factor of existing governance but has not been given the salience or significance it warrants. An outcome perspective is highly relevant to environment management in general and to coastal areas in particular, given that management’s measure is the quantity and quality of on-ground outcomes. Environmental governance offers a substantial lens through which to assess management of Australia’s coasts and can assist in analysis and problem solving. The problems of the coast are largely two fold, one being environmental degradation from a variety of sources and the other the reported lack of integration of management resulting in unclear policies for the area, lacking in form and sophistication (Wescott 2012). Looking globally at what would be able to assist this situation, the concept of environmental governance is all encompassing as a possible analysis tool.

One of the most important questions to coastal management is the level of sustainability achieved by coastal planning. According to Pethick and Crooks, “sustainable coastal resource management requires the safeguarding and transmission for future generations of a level and quality of natural resources that will provide an ongoing yield of economic and environmental services” (Pethick and Crooks 2000, 359). Sustainable management requires both environmental and economic services provided by the coast to be recognised. This thesis goes a step further to look at “environmental governance”; focusing on both the intrinsic values, rights and recognition of the environment and its ability to provide environmental services for humankind (Pethick and Crooks 2000).

The framework of analysis developed in following sections provides an extension of environmental governance to focus on outputs and performance in relation to achievement of environmental goals. In general environmental governance has focused on institutional arrangements, effectiveness, efficiency, social justice and capability capacity.

Commentators have referred to the complexity of environmental governance and problems associated with the environment and environmental management (Head 201, Reed 2008, 2417). As already explained governance has an emphasis on processes and modern definitions of environmental governance include processes that result in fairness, efficiency and social justice (Fakier et al 2005). These definitions also include consideration of institutional forms and arrangements (Kjaer 2004).

Driessen et al (2012, 2) refer to "environmental governance" as "the means by which society determines and acts on goals related to the management of the environment. It includes instruments, rules and processes that lead to decisions and implementation." This insight reinforces the need to extend features of the broader governance literature, and include elements such as:

- Government not the only player
- Environmental governance to reflect increasing social structures
- Multi-level governance – mutual dependence on various tiers of government
- Shifts not uni-linear
- Intersection between private-public interests and rights
- Adaptive management.

Driessen et al note, "what seems to be lacking is a framework that helps meaningfully differentiate between various governance arrangement" (Driessen et al 2012, 3). Frameworks developed by The World Resources Institute as elaborated by Fakier et al (2005) are useful but do not adequately address measures of environmental performance, improvement or degradation. There is general agreement that weak environmental governance causes environmental degradation (see, for example, Fakier et al 2005).

For the purposes of this thesis the simplest definition of performance is to be the amount of area/habitat protected for the environment. Areas in the highest protection category will be better in comparison than areas that do not have this protection afforded to them. For example Ramsar wetlands are established under an international agreement that offers these areas some protection. This agreement refers to maintenance of the "ecological character" of the area, but the intent at an international level may not always be carried out. The amount of area/habitat

protected for the environment becomes the overall goal. Although recognized that conservation biology and ecology can be complicated on the benefits to the environmental from pollution and diffuse sources outside of these areas, this overall goal stands. Levels of protection within these areas will be defined further as environmental goals, however the amount of area without significant change still holds as the broad goal and is supported work on the Millennium Report 2005. A framework for assessment of ecosystems and human well-being used for the Millennium Report 2005 framework looks at ecosystems and their boundaries as the basic framework for assessment for the well-being of human kind, drawing on the concept of ecological services as " the benefits people obtain from ecosystems" (World Resources Institute 2003, 3). This also translates into an overall goal of the amount of area/habitat for the environment. The conclusion of these findings were;

"The most significant change in the structure of ecosystems has been the transformation of approximately one quarter (24%) of Earth's terrestrial surface to cultivated systems. More land was converted to cropland in the 30 years after 1950 than in the 150 years between 1700 and 1850. Between 1960 and 2000, reservoir storage capacity quadrupled; as a result, the amount of water stored behind large dams is estimated to be three to six times the amount held by natural river channels. In countries for which sufficient multiyear data are available (encompassing more than half of the present-day mangrove area), approximately 35% of mangroves were lost in the last two decades. Roughly 20% of the world's coral reefs were lost and an additional 20% degraded in the last several decades of the twentieth century" (Millennium Ecosystem Assessment 2005a), 26).

Recognising current theories from the literature on comparative politics and public policy that attempt to explain the policy achieved that have resulted in these conditions. Two suites of theories exist to explain emerging pattern of the use of instruments that respond for environmental objectives and goals. The first is ideational theories focused on a highly instrumental process. The second is institutional theories that advocate an instrumentalist approach where national institutional focus on what they are most familiar with (Speth and Haas 2006). This thesis is looking at a similar concept for a smaller scale in Australia and the state of Victoria.

Figure 1.1 shows the overall goal as the amount of area/habitat protected for the environment. This goal can relate to principles and criterion in hierarchical format (Van Cauwenbergh 2003).

Figure 1.1 Goal relating to Principle and Criterion in Assessment Framework for Environmental Governance

GOAL

Performance –the amount of area/habitat protected for the environment

PRINCIPLE

General conditions for achieving area/habitat protected for the environment

(e.g. Objectives are required to achieve)

CRITERION

Resulting state of the environment (amount of area/habitat protected) when a principle is respected

(e.g. Environmental Objectives in Strategic Planning)

Source: Lammerts, van Bueren and Blom,1997 and Van Cauwenbergh 2003, 233.

Given that the overall principle “General conditions for achieving area/ habitat protection for the environment”, principles which fit under this overarching level have been developed (Van Cauwenbergh 2003). These principles and criteria are seen in Table 1.1.

Environmental governance has mechanisms (institutional arrangements), objectives (effectiveness and efficiency) and principles (such as social justice) and resources (for example capacity) involved. Fakier et al (2005) have chosen to see these fundamental areas of environmental governance as elements. Elements used to describe the basic fabric of environmental governance by both Fakier et al (2005) and the World Resources (2003) are institutional arrangements, effectiveness, efficiency, social justice and capability capacity. These elements have been aligned with the principles and criteria of the framework in Table 1.1 and provide some key insights into the usefulness of the criteria that will be discussed further in Chapters 5 and 6.

Table 1.1 Principles and Criteria of the Environmental Governance Framework and related Elements of Environmental Governance

Elements *	Principles	Criteria
Institutions and law. Authority level. Accountability and transparency. Property rights and tenure. Science and Risk Markets and financial flows. Integration into other sectors.	Objectives are required to achieve.	Environmental Objectives in Strategic Planning
Institutions and law Authority level. Accountability and transparency. Property rights and tenure. Science and Risk. Markets and financial flows. Integration into other sectors.	Habitat is a major determinant of the environment. A Spatial orientation underpins ecology and the environment.	Spatial Links – Ecological Techniques
Institutions and law Authority level. Accountability and transparency. Science and Risk	Monitoring is required for management.	Thresholds and feedback loops
Property rights and Tenure Participation, rights and Representation.	That the environment has a group or individual to speak and advocate on its behalf. Market forces alone will not operate to provide communication.	Advocacy
Participation, rights and Representation.	There is efficiency, efficient and competitive advantage gains to be made by using knowledge management techniques Information for Spatial Links.	Knowledge Management

Source: Adapted from Van Cauwenbergh 2003.

*Elements are derived from The World Resources Institute 2003, as modified by Fakier et al (2005).
Institutions and law *Who makes and enforces the rules for using natural resources? Who resolves disputes?*
Participation, rights and representation *How can the public influence or contest the rules over natural resources? Who represents those who use or depend on natural resources when decisions on these resources are made*?
Authority level *At what level (local, provincial or national) does the authority over resources reside*?
Accountability and transparency *How do those who control and manage natural resources answer for their decisions, and to whom? How open to scrutiny is the decision-making process? Are there rights to environmental information?*
Property rights and tenure *Who owns a natural resource or has the legal right to control it?*
Markets and financial flows *How do financial practices, economic policies, and market behaviour influence authority over natural resources?*
Science and risk: *How are ecological and social sciences incorporated into decisions on natural resources use to reduce risks to people and ecosystems and identify new opportunities*?
Integration into other sectors: *How well are environmental issues integrated into other sectors and into decision making in those sectors?*

1.3 Establishing a Framework of Analysis

The concept of environmental governance appears to offer significant opportunities to the analysis of and environmental management towards Australia's coasts. Notwithstanding the broad base of the concept, identifying specific principles and criteria of environmental governance that appear to contribute to achievement of environmental goals has utility.

These principles and associated criteria have been developed from an extensive examination of the literature, including management in business and analysis of natural resource management and conservation. In the case of knowledge management, documents indicating the knowledge strategies of private sector companies have been examined.

Three case studies developed over the next three chapters as Chapters 2, 3 and 4 will be examined in Chapter 5 using this framework to see what criteria in the framework were met. The goals achieved in these case studies are then discussed in Chapter 6. It is premised that if the criteria are met, then the associated principle would be operating and assisting goals to be delivered.

1.3.1 Key criteria and principles

The five criteria selected to elaborate the concept of environmental governance are:

- Environmental objectives in strategic planning
- Spatial links-ecological techniques
- Thresholds and feedback loops linked to legislation
- Advocacy
- Knowledge management

These criteria are also are utilised as a framework to analyse empirical case studies, presented in Chapters Two, Three and Four of the thesis. Further elaboration on each of these criteria and the principle that they were derived from (as seen in Table 1.1) is provided below.

1.3.2 Environmental Objectives in Strategic Planning

Effective management has become accepted as key to achievement in many fields and is recognized as consisting of four major steps; planning, organizing, leading and controlling (Barton et al 2001, Robbins et al 2009). Management studies have demonstrated that setting (and agreeing to) objectives in the planning step is highly correlated with successful outcomes (Robbins et al 2005). For example, in considering the natural environment, maintaining a set of key ecosystems types and geomorphic areas that retain near natural or pristine values could be considered key objectives of environmental governance. There are different types of planning with strategic planning referring to longer term planning, as opposed to short term action (or operational) planning. Whereas short term planning will have results, far reaching effects would be expected from longer term planning (Viljoen and Dann, 2003).

Strategic planning, coined and designed to take advantage of opportunities and strengths and diminish threats and weaknesses, has been used extensively by successful private enterprises. Companies in the private sector have 30-year horizons and are actively moving to identify new resources, markets and opportunities. Globally adept, companies like British Petroleum are planning far ahead of governments and often make reference to governments as being well behind the company's forward-looking agendas, including in the area of environmental planning (Pokesch 1997, Robbins et al 2000).

The importance of setting objectives is clearly laid out in the theory of strategic planning, where directions are set first by defining objectives, determining, exploring and debating options before moving to the final selection of an optimum solution (Viljoen and Dann, 2003). The public sector in Australia in the 1970s and 1980s demanded accountability and service delivery, leading to service and provider models that emphasised project management and strategic planning (Haward and Vince 2009, Head 2011). The importance of objectives was therefore recognised by the public sector, although frequently challenging to achieve for the environment in output and outcome terms.

Since the definition of strategic planning involves long term planning, this discipline is especially relevant to the environment, which also has long term needs.

Intergenerational equity and discounting are a function of long time horizons that are suitable for many decisions in management and conservation of the natural world (Lindenmayer and Burgman 2005). Loomis refers to environmental planning for land as "a plan is a design or scheme of how to attain a given objective" (Loomis 2002, 11). A statement of objectives is considered critical, along with an inventory of quantity and condition of the natural resources (Loomis 2002).

Natural resource management decision-making in Australia as proposed by the National Land and Water Resources Audit clearly outlines the setting of priorities and objectives (Commonwealth of Australia 2002a), b), Lindenmayer and Burgman 2005, 443). One advantage of environmental governance is that there is an expectation of aiming for clear environmental results linked to environmental objectives.

Types of Environmental Objectives include;

1. Protection of ecological components (Lindenmayer and Burgman 2005).
2. Identification and plans to address threats (House 2008).
3. Actions to minimize unacceptable impacts (Jiricka and Pröbstl 2009).

The first of these objectives is addressed in the following section. The second and third types of environmental objectives are often used in the absence of ecological information. There is clearly a difference between sustainability principles and the environmental objectives presented above.

1.3.3 Spatial links - Ecological techniques

The evidence for spatial links and ecological techniques as a criterion of importance in environmental governance comes from science and ecology. The recognition that decision-making requires clear and agreed definition of what part of the resource will be conserved and left for use by fauna and flora was particularly apparent in the 1970s and 1980s in Australia. Until that time many resources were used without the environment as part of negotiations since the population, although increasing, did not result in impacts that drew attention. Environmental assessment, largely translated to Australia from the USA, fitted the increasing demand to have the environment considered (Fisher 1980, Ruddy and Hilty 2008, Pope et al 2013, 1).

The bottom line on spatial components for the environment was the realisation in the 1970s by scientists that the habitat of individual species was very important to the preservation of wildlife and the conservation of different species. Lindenmayer and Burgman (2005) see "habitat as associated with a place – a geographic location" (Lindenmayen and Burgman 2005, 367).

The idea that habitat was a main determining factor for wildlife survival became firm in the 1970s in Australia with noticeable habitat losses, such as was observed as a consequence of the forestry industry. The plight of the Leadbeater's possum as a threatened species in Victoria's highlands illustrated the role of habitat requirements and knowledge of spatial distribution in decision-making. Hollows taking 40 to 60 years to form in the centre of trees in hardwood forests and recognised as a critical habitat for Leadbeater's possum bought attention to the linkage between species decline and habitat availability and protection (Smith and Lindenmayer 1988).

Old growth forest was identified as required habitat for a number of species. It became increasingly evident that breeding programs alone would not increase numbers of wildlife. Habitat was critically important, defined as the amount of physical dimensions that an animal population required to survive in the wild (Krebs 1985). Habitat loss was established as key to conservation and campaigns to preserve critical habitat were undertaken (Lindenmayer and Burgman 2005). Conservation of habitat, involving studies such as the determination of stream widths of vegetation that are optimum for individual species, has continued through the 1990s and 2000s (McNeely et al 1994, Lindenmayer and Burgman 2005, McNeeley et al 2008). More recent scientific studies have further consolidated early studies on the importance of hollows in forest ecosystems, including work on bats and other possum and glider species (Lindenmayer et al 1991, Lumsden 1993, Gibbons and Lindenmayer 2002, Lumsden et al 2002, Whitford 2002, Whitford and Williams 2002, Smith 2003, Pearson et al 2005, Koch et al 2009). This lead to further work on spatial habitat in the 1990s and 2000s, with the development of habitat boundaries for different species (Anderson and Marcus 1992, Pearson et al 2005, Wayne et al 2006). All of this came from the need to put forward the case for protection of various parts of the habitat. Some of these debates have been about what parts/components to put into reserve systems and what to protect as part of industry operations eg forestry (Wayne

et al 2006). As resources decreased, the debate has revolved around the acceptable degree of loss in order retain environmental values, such as the number of species. One example of such discourse and trade-off can be seen in the Victorian Fauna and Flora guarantee (Victoria Department of Natural Resources and Environment 1997, Wayne et al 2006).

Prediction became critical to setting objectives, requiring substantial development of our ability to model the world. There is evidence to suggest ecological models need to be linked to all levels of ecological organisation, including species, species community and ecosystem levels, however it is accepted that all predictive models are valid and no single one is prescribed (Lindenmayer and Burgman 2005, 449). Some examples of ecological models critical to environmental management are the estimation of minimum viable populations (MVP) for conservation efforts and maximum sustainable yield (MSY) for living resource exploitation.

Methods also involved in making ecological predictions include ecosystem management, surrogates, variable use of the term mode, adaptive management and design of reserves using island biogeography principles (Lindenmayer and Burgman 2005, 449). Sutherland (2006) summaries seven possible main methods: as extrapolation, experiments, phenomenological models, game-theory population models, expert opinion, outcome-driven modeling and scenarios (Sutherland, 2006, 601).

A simple strategy is to conserve areas of greatest environmental variability if information is scarce (Lindenmayer and Burgman 2005). As ecological understanding and applied management techniques have evolved, the central theme depicted by Ruiz de Infante Anton et al (2013, 552) as "the distribution of individuals over space and time is a central theme in ecological theory" has remained. Further to this spatial ecology has developed, closely related to conservation biology, to emphasize the study of habitat loss (Collinge 2010). "Spatial ecology centers on how specific spatial arrangements of organisms, populations, and landscapes influences ecological dynamics" (Collinge 2010, 69).

This criterion is important to environmental governance because it forms the measurement factor for this type of governance. Other types of governance measure efficiency and/or effectiveness in monetary terms or satisfaction of people. Ecological techniques are how we observe and measure the environment. The definition of Spatial Links – Ecological techniques for this thesis is the spatial area defined by an ecological technique for the environment. It may relate to an environmental value, species habitat or other part of the environment. Spatial links – Ecological Techniques has a function to represent the environment in negotiations on use of the resources or conversion of ecosystems to man modified environments (Millennium Ecosystem Assessment 2005 a), 32, World Resources Institute 2003, 188).

1.3.4 Thresholds and feedback loops linked to legislation

Thresholds and feedback loops have been seen in biology as part of describing systems with information resulting in a regulatory function. In the field of biological regulation, "regulations may be defined as the constraints that adjust the rate of production of the elements of a system to the state of the system and of relevant environmental variables. The main operators of these adjustments are feedback loops"(Thomas et al 1995, 247). Thresholds are described as standards with exceedence values that trigger management responses. Thresholds are a point beyond which new properties emerge and can be linked to mathematical models invalidating predictions at a lower level (World Resources Institute 2003, 215). These principles have been applied to environmental management, particularly environmental management that involves pollution control. In some cases these triggers are attached to legislation that have fines attached to them, so introducing market forces to provide incentive. In other cases, they are related to regulation and policy/planning outcomes (Mallee Catchment Management Authority 2012).

Separately to this, monitoring has evolved as a key requirement for management, both of organisations and projects. One illustration of this in natural resources planning is adaptive management. Adaptive management is defined as "allowing flexibility in design of new management actions to account for feedback from previously implemented management actions and new scientific research" (Loomis

2002, 558). Reports on the implementation of adaptive management are not consistently in favor of achieving environmental goals. "Adaptive management aimed at testing hypotheses is excellent in principle and widely advocated. In reality, however, it is almost never carried out because the changes in management usually have to be severe in order to bring about detectable changes in a reasonable time, and the political risks of such management are usually considered too high" (Sutherland 2006, 599).

Taking this into account, a basic management principle is monitoring (Lindenmayen and Burgman 2005). Described as measurement assembled from regular monitoring following implementation of policy by the World Resources Institute in its conceptual assessment framework for the Millennium Assessment in 2005, monitoring may draw on spatial assessments, accounts and/or science assessment of a comprehensive indicator-based assessment (World Resources Institute 2003, 199). Recognised in management circles as undersubscribed, the costs of not monitoring in business and industry are high. One reason why monitoring is enforced in business is that the businessperson has a very high motivation to get the business to do well. Their job and income depend on it, also they are in charge of the business and the many facets of the business and so have the power to make changes. In the environmental game that picture is not so clear. There are many environmentalists that have a great interest in the environment succeeding out of any transaction, however there are not too many of those that have the power to oversee the amounts of habitat given back, managing all facets of that business. Monitoring and evaluation is widely accepted as an important step in planning and is an input to feedback in natural resource management (Robbins et al 2009).

Despite the importance of monitoring, often recommended by scientists and biologists, the fight for basic research dollars and preliminary funding for programs is often the focus politically. Scientists generally have more to gain by getting their initial funding up and find running with the fight for subsequent monitoring even more difficult than gaining initial research dollars (Anderson et al 1997). Anderson et al (1977) comment on the challenges arising from regular reporting: "In the five years until the next report, there is an enormous amount to do if it is to say anything useful about what progress there has been. There is an even bigger job in figuring out

why there has not been any change; what worked, what did not, and why. We should not underestimate the size of the task of information gathering (but nor should we delay action while we endlessly wait for information). The gaps in our knowledge are quite parlous-yet this not a job for SoE, but for research and monitoring. There have been few major advances in the effort put into these areas, although some welcome initiatives have been implemented in some areas" (Anderson et al 1997, 181).

For these reasons, this criterion is left broad to assist the investigation into what is important to achieving environmental goals in governance. It is thought that thresholds that have legislation attached may produce results. There is a large amount of support for monitoring in management as a criterion for success.

1.3.5 Advocacy

Advocacy is defined as the process of supporting a cause or proposal (Merriam-Webster 1999 in Minnis and Stout Mc Peake 2001). The definition of the term "advocate" has two contexts. The first is specific to a tribunal or judicial court, in which the advocate is the "one that pleads the cause of another." The other context, which is more appropriate to our discussion herein, is more general: An advocate is "one that defends or maintains a cause or proposal" (Minnis and Stout McPeake 2001, 4). There is evidence that it is important to have this support in order to achieve something for the environment. There is limited information on the optimum strategy for environmental advocacy (Cunningham 2002 ,148, Handy 2000, Lemos and Agrawal 2009), yet a general characteristic of environmental advocacy is a lack of resources (Bellingham 2013). Early examples of environmental advocacy have included the actions of the Wilderness Society and the Sierra Club in North America (Minnis and Stout McPeake 2001, 4). Recognizing that they are two main types of environmental advocacy, an advocate can act:

1. as a protector of what is already held in conservation reserve to some degree. This is usually to do with environmental management within a spatial area or component of the resource or
2. to an actively promote substantial additional areas to be reserved for conservation.

It is unclear if public involvement in environmental decision-making translates to successful environmental outcomes. There are advantages to government of citizens and stakeholder engagement such as an increase in trust of the government. Other factors that are of assistance to governments from public engagement and consultations are:

- Policies can gain legitimacy and hence higher compliance
- An increase in knowledge and a leverage of resources from society
- Understanding community needs
- The obtainment of policy relevant information and ideas from society (Lee and Thynne 2011, 76).

These advantages to government are not defined as advocacy to achieve environmental goals in this thesis. Such outcomes, may, however, indirectly lead to increased commitments to the environment. Despite an increase in public demand to be involved in environmental decision–making, and the emphasis on consultation by public government bodies as part of the democratic decision making process, this requirement may not result in an increase in environmental advocacy as defined as "pleading for a cause"; that results in an increase in protection for the environment or additional areas that are reserved for conservation. As a result advocacy is defined here as "the support to the cause"; and this support may come from public or private bodies. This is consistent with the premise of governance as more than government (Ladeur 2004), in particular the idea of "citizen governance" (Stewart et al 1984, Boscarino 2009).

Reed (2008) points to the increasing demand of the public for participation in environmental decision-making, and an associated expectation of this participation as a democratic right; looking, for example, at rights in the 1998 Arhus Convention. Public participation is extensively covered in the literature, but participation is not necessarily synonymous with advocacy but may allow access by environmental advocacy groups into a process (Younge and Fowkes 2003, 2007, Yuen 2007) (Younge and Fowkes 2003, 2427). The education and values of the public are proclaimed as important in determining interest in standing for the environment. This is largely uncontested and unexplored. There is some evidence that the number of advocacy organisations for the environment will have an influence on federal policy in the US (Rees 1999, 5).

The demand for society to be involved in environmental governance has resulted in gradients from public participation in established government processes to advocates, for example NGOs that focus on setting their own agendas for the environment. The increase in stakeholder involvement has been the most noticeable shift in environmental governance over the last decade, taking governance clearly away from merely existing as a public sector activity (Shandas and Messer 2008).“We are, in effect, operating in a world in which there is a growing disconnect between the demand for governance and the conventional mechanisms for addressing this demand” (Driessen et al 2012, 22). This is especially apparent in the instance of global environmental issues (Young 2009, 4).

Problems have been noted with participation in government processes, with some writers reporting frustrations in results for effort (Delmas and Young 2009). Again there is evidence that an increase in this activity does not necessarily have a direct link to issues related to the environment. “Civic engagement (or community consultation) has become a purposeful and planned dimension of policy development in most Australian jurisdictions since the 1980s” (Head, 2011, 104). Reed (2008) refers to a progression of methodologies for achieving participation in planning and policy, referring to Arnstein;’s “ladder of participation” with different levels of participation for different situations driven by bureaucratic process (Reed 2008). Pimbert (2003) has also developed different levels of participation in government planning processes into a “typology of participation” featuring a range of involvement by stakeholders to the highest level of self-mobilization. “People participate by taking initiatives independent of external institutions to change systems”(Pimbert 2003, 79). This work is largely about evoking an advocacy response from society to allow inputs into planning with an objective of an improvement in the quality of decisions (Arnstein 1969, Thomas 1993, Stringer et al 2006).

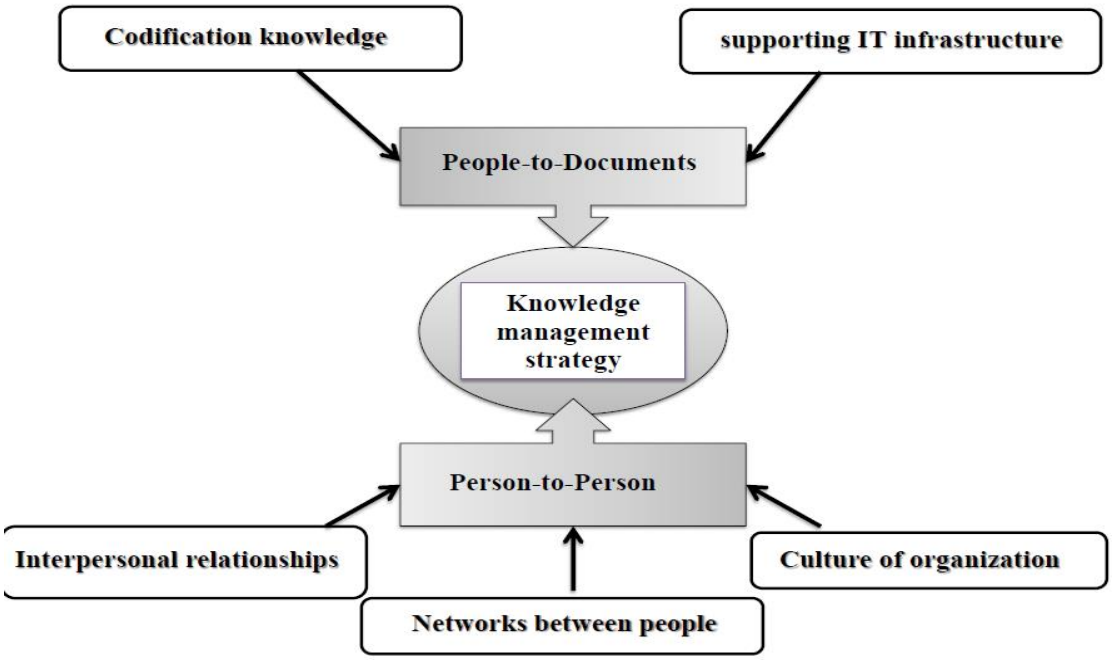
1.3.6 Knowledge management

Knowledge management is not well understood and its definitions are similarly diverse. Awad and Ghaziri (2004) present 16 definitions of the concept (Pischke 2013, 4), but the clearest is “knowledge management is a discipline of identifying,

capturing, retrieving, sharing and evaluation of an enterprise's information assets" (KPMG 2000 in Awad and Ghaziri 2004, 4). This definition of knowledge management embraces data, information and application. Often touted as giving competitive advantage, knowledge management has been the domain of the private sector (Quintas et al 1997).

A major challenge for private companies has been enunciated by John Browne from British Petroleum in 1997 as " Using knowledge more effectively than their competitors do"(Awad and Ghaziri 2004, 4). This is consistent with the view that this business environment using knowledge management is a world that challenges the traditional way of doing things (Prokesch 1997, 3, Burstein et al 2002). Figure 1.2 illustrates research and knowledge and the involvement of people, data and information to create further knowledge. The acknowledgement of the culture of the organisation, interpersonal relationships and networks between people as legitimate and valued areas included in knowledge management is seen in Figure 1.2.

Figure 1.2 Model of research and knowledge management



Source: (Jivan and Zarandi 2012)

The concentration on the competitive advantage of knowledge has resulted in several techniques to focus both expert knowledge of humans and other forms of information for gain. For instance analyzing the Xerox Corporation and knowledge management to gain competitive advantage in the 1990s and early 2000s, five knowledge techniques are visible.

- Document repositories, consisting of both paper and digital documents.
- Navigation to knowledge, such as systems that map, direct, visualize and summarize knowledge for organisations and individuals.
- Supporting communities of knowledge workers, encompassing a vast array of new ideas that major organisations are using to encourage awareness of others' knowledge and experiences. Support can be systems using web technology so others are aware of the allocation of staff time to capture information from knowledge focus groups. This may consist of web pages on the individual or subjects that are established.
- Knowledge flows, a separate category because of its importance in expanding growing and creating new knowledge as it is shared by building on what is already there and getting inputs from discussions with others. A knowledge flow is the transfer of data, information and its application from knowledge provider to knowledge seeker. Forums, exchange of staff and forming partnerships are examples. Obviously to get staff to "flow" their knowledge to another requires incentives and rewards as well as cultural shifts. Rewards and recognition are used at British Petroleum in a concept called "T- shaped managers" to catch the concept of rewards for vertical (business unit) and horizontal (knowledge-sharing) responsibilities.
- Culture, cultural characteristics of an organization that influence knowledge. Sony, a company world renowned for its shifts in knowledge and associated success in new products, stresses its key objective for the company as being selection of products for development that delight customers. Product innovation that is undertaken by successful companies includes a system of quickly getting and testing ideas. Assigned "Knowledge Brokers" are used to collect and generate ideas, and test them quickly as well. Creativity is also recorded as requiring constant project objectives that do not change

> continually over a period of time and resources to undertake these objectives (Brown and Duguid 2000).

This has now evolved further in today's knowledge economy where organizational performance and competitive advantage are derived more from what a firm knows and the human capital that enables it to use what it knows rather than from manual labor (McIver et al 2013, 597).

Since the mid 1990s there has been attention on knowledge management and stakeholder (mostly community groups) input into government processes and decisions, especially in the environmental sector (Head 2011). Government consultation and public participation may improve the government's planning with the government's objectives (Lee and Thynne 2011, 76). Other knowledge management techniques also started to be applied to natural resource management in the mid to late 1990s. Knowledge management used to assist meeting environmental goals comes from two major movements;

1. Innovation in the public sector management and the use of governance techniques derived from the private sector.
2. Suspicion that investments in research are not translated into environmental management.

Most commonly, questions of knowledge exchange have been asked in relation to science and management. One primary reason for this is the high cost of scientific research, the substantive public sector investment in research, and the follow on question, is this knowledge being utilized after it was gained at cost to tax payers (Awad and Ghaziri 2004).

1.4 Summary

Table 1.2 Summary of Environmental governance framework and attributes of each criteria from the literature.

Literature included management, conservation biology, governance, natural resource management, environmental governance, public administration, ecological theory, integrated pubic land management, international law, social- ecological theory and public policy.

Criteria in Framework	*Attributes of criteria from literature*
Environmental Objectives in Strategic Planning	a. "Define the targets that need to be achieved within the scope of the vision to realize the mission" (Viljoen and Dann 2003, 47). b. Linked directly to the definition of environmental governance as 'for the environment' (Driessen et al 2012). c. Strategic planning is aimed over long periods of time (Viljoen and Dann 2003). d. The environment requires long time frames (Lindenmayer and Burgman, 2005). e. Objectives can be a spatial amount of ecosystem remaining. Also represented as the amount of decrease in conversion of ecosystems (World Resources Institute 2003, Millennium Ecosystem Assessment 2005 a), 4). f. Documented planning objectives are the first element in accountability (Australian Capital Territory Government 2011, 5).
Spatial links – ecological techniques	a. The spatial habitat element is accepted as key to environmental protection (Lindenmayer and Burgman 2005, Millennium Ecosystem Assessment 2005 a), 124). b. "the distribution of individuals over space and time is a central theme in ecological theory" (Ruiz de Infante Anton et al 2013, 552). c. Large variation in ecological techniques accepted (Lindenmayer and Burgman, 2005). d. Clarification of areas on maps greatly assist in achieving protection and recommendation for the environment (Clode 2008, 41).
Thresholds (linked to legislation)	a. Monitoring of thresholds important to establish if there is success (World Resources Institute 2003). b. "Measurement assembles information from regular monitoring" (World Resources Institute 2003, 188).

	c. Monitoring results in observing if efforts are having an effect (Speth and Hass 2006, 130). d. 'Thresholds are a point where beyond new properties emerge'(World Resources Institute 2003, 215).
Advocacy	a. Defends or maintains a cause or proposal (Minnis and Stout McPeake 2001). b. Increase in public demand to be involved in environmental governance (Kjaer 2004). c. Governance includes both government and non-government structures (Driessen et al 2012). Environmental advocacy is likely to come from non-government structures as the public becomes disenchanted with government. d. "The relative power of nation-states has diminished with the growth of power and influence of a far more complex array of institutions, including regional governments, multinational companies, the United Nations, and civil society organizations. Many small stakeholders are also increasingly involved in decision-making" (World Resources Institute 2003, 48). e. Communication is recognized as a major factor in management (Robbins et al 2009, 344). Advocacy is the communication for the environment, since it cannot speak for itself.
Knowledge	a. Flows of information create more knowledge, as discussion is an important component (Awad and Ghaziri 2004, 93). b. Data and information are different to the generation of further knowledge and understanding (Awad and Ghaziri 2004). c. Techniques exist to encourage sharing of knowledge and increase recall or access to what is required when (Awad and Ghaziri 2004). d. Using knowledge more effectively than competitors to get a result (Prokesch 1997). e. Linked to environmental objectives since a clear purpose allows focus of learning efforts in order to increase competitive advantage (Prokesch 1997). f. Creativity enhanced (Brown and Duguid 2000). g. "communication programs have both informed and changed preferences for biodiversity conservation and have improved implementation of biodiversity responses" (Millennium Ecosystem Assessment 2005 a), 124).

1.5 Elaborating the criteria: The Case of Eastern Victoria (Pre-Test)

To test these criteria, a desktop study of Victoria's eastern coast was undertaken. This pre-test covers some 40% of Victoria's coast as depicted in Figure 1.3, including the coastline from San Remo near Phillip Island to the New South Wales border and the Gippsland Lakes. Australia's coastline is about 36700 km in length, and Victoria is a southern state of Australia with a coastline of 4000 km (see Figure 1) (Wescott 2000). The definition of the Victorian coast used by the Victorian Coastal Strategy 2002 is the sea and the seabed to the State limit of three nautical miles or 5.5 kilometres; and land and inland waters within the coastal catchment (Victorian Coastal Council, 2002). Referring to this definition of coast, also enunciated in the introduction to this thesis, there are six marine national parks and a marine sanctuary at Beware Reef that cover approximately 5 percent of the Victoria's eastern coast in this study area (Gippsland Coastal Board, 2002).

Figure 1.3 - Map of Victoria, Australia depicting the area of Victoria's Eastern Coastline

Source: Shaw 2010

1.5.1 Environmental Objectives in Strategic Planning

Looking at institutional arrangements as background to the strategic planning in this case study area, there is a clear distinction between private and public land. A prominent feature of Victoria's coastline is the relative absence of development in areas between townships. Public land management, with its declared parks and reserves, has been a substantial driving force behind this with 96% of the coastal land under the control of the Victorian Minister for Environment on behalf of the Crown (Victorian Coastal Council, 2002).

A large number of public agencies have either direct or indirect interests in Victoria's coast based agencies whose planning impacts directly or indirectly impact upon the coast and those agencies who regulate activity along the coast (including in the near shore marine environment). Statutory planning influencing private land has also been influential and has sought to halt strip development and concentrate building in key areas termed "activity nodes". These activity nodes have existing infrastructure and historically the proposal has been to intensify development within them (Gippsland Coastal Board, 2002). In particular, the Victorian Coastal Strategy 2002 suggested coastal development be directed away from sensitive areas and managed within defined existing settlements (Victorian Coastal Council, 2002). Statutory planners attempt to keep up with controls and sustainability for their local government areas against an ever-increasing number of applications for building and development.

Victoria revised the coastal strategy in 2008 linking to Integrated Catchment Management (ICM) as the stated "comprehensive management framework for the coast of Victoria" with a clear set of four guiding principles. The first principle provides "for the protection of significant environmental and cultural areas" (in keeping with a definition of sustainability). There is a clear order for the application of the guiding principles, with the first principle nominated as overriding. The second principle "Undertake integrated planning and provide clear direction for the future" allows for the planning mechanisms necessary and includes the precautionary principle in detailed points that are subtitled under this principle. The third principle "Ensure the sustainable use of natural coastal resources" is aimed at ecological sustainability and integrated analysis.

A slight decrease in emphasis on development in activity nodes from the 2002 strategy has produced a fourth principle in the 2008 strategy: "Principle 4. Ensure development on the coast is located within existing modified and resilient environments where the demand for development is evident and the impact can be managed. When the preceding principles have been considered and addressed, this principle aims to ensure that:

- urban development on the coast is directed to appropriate areas within existing settlements and activity centres"
- development on coastal Crown land is coastal-dependent or closely related to coastal-dependent uses and is directed to activity nodes and recreation nodes" (State Government Victoria. Victorian Coastal Council 2013).

In 2013, the Victorian government released a draft document for discussion as the Draft Victorian Coastal Strategy 2013. This document details similar principles in a hierarchy to those in the 2008 Victorian coastal strategy as seen below, with polices and actions grouped to align with these principles.

> "Principle 1: Recognising and protecting significant environmental and cultural features of the coast
> Principle 2: Enabling stakeholder participation in developing clear directions for future use of the coast
> Principle 3: Ensuring sustainable use of natural coastal resources and suitable development on the coast
> Principle 4: Ensure development on the coasts is located within existing modified and resilient environments where the demand for development is evident and the impact can be manage" (Victorian Government 2008, 25).

Shaw (2008) analysed six major types of strategic plans for the Victoria's Eastern coastline. These plans had planning horizons of 15 to 25 years and included Coastal Action Plans that reportedly followed the Victorian Coastal Policy 2002 to implement "activity nodes" and avoid strip development along the coast (Connell and Wagner, 2006). The Victorian Coastal Policy 2008 overarching principle has now been changed from a focus on strip development to protection of environmental areas. It is questionable whether these earlier coastal action plans are consistent with the updated policy.

The analysis identified nine environmental concerns and threats well known throughout Australia to natural resource planning. Biodiversity, retention of

vegetation quality, encroachment on wetlands, visitor pressure, impacts on Ramsar listed wetland sites, changes to coastal processes, water quantity in stream and estuaries, climate change and water quality issues from diffuse sources in the catchments were found as the major environmental issues.

Biodiversity is the retention of diversity of fauna and flora in the coastal areas. This included the marine environment using the definition for coast found in the Victorian Coastal Strategy 2002. It is important to include ecological complexes for fauna and flora, diversity within species, and ecosystems (State of Victoria, Victorian Coastal Council 2002). Retention of vegetation quality is related to biodiversity and Ecological Vegetation Class classifications exist for most of Victoria, including the percentage of remaining indigenous vegetation.

Encroachment on wetlands is listed as a separate issue as large sections of wetlands remain well protected, however incremental destruction of wetlands continues. This usually involves the filling in of wetlands.

Visitor pressure on the coast in eastern victoria has been largely undefined. It was estimated in 1999 that Victorians alone make over 70 million visits to the coast each year (TQA Research Pty Ltd 2000). The impacts on the coast from visitor pressures range from the building of infrastructure to wildlife disturbance from pet dogs.

Impacts on Ramsar listed wetlands are important linked to the international obligations associated with these sites. The obligation relates to the integrity of the ecological processes and character of these wetlands and other significant criteria.

Changes to coastal processes have always been debated as natural forces give way to changes in coastal processes. The issue referred to here is man made changes affecting coastal processes. An example of this is changes to sand bars and embankments protecting estuaries.

Water Quality in Victoria has been well monitored over time with the Water Quality Network for Victoria. The establishment of beneficial uses of water has paved the way for the establishment of targets for water quality. Point sources of pollution

leading to changes in water quality can be distinguished from diffuse sources. Environmental flows for streams will alter the effects of water quality, particularly from point sources.

Only recently has climate change been an identifiable issue in planning even though evidence of its existence has been in literature for approximately 15 years. This completes the nine selected environmental concerns and threats that if addressed would substantially improve the coastal environment (Shaw 2008). A review of the strategic plans for the Eastern Coast of Victoria was undertaken by Shaw in 2008 to assess which of the strategies and plans have the environmental concerns as objectives.

Fundamental to addressing the environmental concerns of the coast is the explicit recognition of environmental issues in the objectives of the strategic plans. Table 1.3 indicates the analysis of environmental issues for six major types of strategic plans for Victoria's eastern coast in 2006. Management plans across both private and public land have been selected in this analysis.

Table 1.3 Explicit Recognition of Environmental Objectives in the objectives of a strategic plan (Shaw 2008)

Plan	GLCAP	Vic Coastal Strategy	ICP-CAP	Draft Estuaries Coastal Action Plan	SEPP Waters of Victoria	Urban Dev Frame
Date of Strategic Plan	1999	2002	2002	2006	1988	2005 to 2007
Environmental Concern:						
Biodiversity	←	▯	→←	▯	▯	←
Retention of Vegetation Quality	←	▯	→←	▯	▯	←
Encroachment on wetlands	▯	▯	→←	▯	▯	→←
Visitor Pressure	▯	▯	→←	▯	▯	▯
Impacts of Ramsar wetland sites	→←	▯	→←	▯	▯	←
Changes to coastal processes	→←	▯	→←	→←	▯	←
Water Quality in streams & estuaries	→←	→←	▯	▯	□	←
Climate change	←	▯	▯	▯	▯	▯
Water quality, includes actions for catchment management	←	→←	▯	→←	▯	←

KEY: ▯ =Explicitly addressed as major objective ← =Addressed to a minor extent

→← =Addressed to some extent ▯ =Not Addressed

□=Major changes resulted to this environmental concern resulting from the strategic plan

Abbreviations:

GLCAP: Gippsland Costal Board 1999 Gippsland Lakes Coastal Action Plan;
Vic Coastal Strategy: The State of Victoria, Victorian Coastal Council, 2002 Victorian Coastal Planning for Gippsland
IPC_CAP: Gippsland Coastal Board Integrated coastal planning for Gippsland – Coastal Action plan
Draft Estuaries Coastal Action Plan: Gippsland Coastal Board & West Gippsland Catchment Management Authority 2006 *Draft Estuaries Coastal Action Plan;*
SEPP Waters of Victoria: Environmental Protection Agency 1988, State Environment Protections Policy (Waters of Victoria);
Urban Dev Frame- Urban Development Frameworks for Gippsland Towns, 2005 – 2007

Source: Shaw (2008)

Table 1.3 shows the lack of consistency across the six plans in objectives explicitly addressing the environmental concerns. The overarching Victorian coastal strategy at the time of analysis, the Victorian Coastal Strategy 2002, explicitly refers to Biodiversity and Retention of Vegetation as part of its fundamental objectives. The other environmental issues, including climate change, are not so comprehensively addressed (Shaw 2008).

Two earlier Coastal Action Plans have environmental concerns that are addressed to some degree. They rely on impact development rating for environmental and physical impact of development proposals in conjunction with local statutory planning processes. Some of the criteria appear to be less stringent for the areas outside of existing townships. The other Coastal Action Plan that was reviewed, the Gippsland Estuaries Coastal Action Plan, addresses 25 estuaries along the eastern coast, comprising a suite of small and discrete catchments, less than 15 square kilometers. While the plan addresses nearly all of the environmental issues with a comprehensive approach, the jurisdiction is for small catchments of public land. Notably this plan does not have management in the face of climate change as one of its objectives.

The State Environment Protection Policy (Waters of Victoria) covers the whole of Victoria and has explicit objectives relating to water quality to provide the statewide statutory water policy framework. In the case of point sources of pollution for streams and estuaries, beneficial uses are protected with enforcement. In the case of catchments and diffuse pollution, the emphasis is on Catchment Management Authorities and Coastal Action Plans to put in place actions that will meet the specified beneficial uses. One such Coastal Action Plan, The Gippsland Lakes – Coastal Action Plan 1999 does not have water quality as an explicit objective. The estuaries plan does include an explicit objective relating to water quality, however this plan is for smaller areas of public land (Shaw 2010).

The Urban Development Frameworks address some environmental concerns to a minor extent. Their objectives relate to protection of significant environmental sites and confine development to “access nodes” where there is already significant development and infrastructure. The down grading of the principle in the revised

Victorian coastal strategy relating to “development directed to existing settlements” leaves compliance of the Urban Development Frameworks with the state strategy in question (Shaw 2008, 2010).

A further report to the Urban Development Framework has been developed as an ancillary component. It is a desktop study to provide some guidance for between settlements along the Eastern coastline and the future development. The Between Settlements Townships report looks at the adequacy of local Planning Schemes to address future planning issues. It concludes that the local planning schemes are not adequate, especially with regard to future planning of the location of tourism developments (East Gippsland Shire Council, Wellington Shire Council and Department of Sustainability and Environment. Victoria 2007a).

Climate change management and adaptation does not appear in the environmental objectives at the strategic level in most of the plans reviewed, however is prominent in the Victorian Coastal Strategy 2008 as one of the three major issues. Translation to other strategic plans will be necessary as impacts on remnant vegetation and habitats from climate change increase. Its appearance in Urban Design Frameworks as a key issue is encouraging (Shaw 2010).

In summary, planning for Victoria’s eastern coastline translates environmental concerns as objectives from policy to planning predominantly for smaller parcels of public land. These smaller parcels of public land will also have climate change effects, including storm surges that are yet to be fully quantified. Water quality has beneficial uses objectives that have been prescribed as objectives with a review mechanism. Urban Development Frameworks and local planning schemes for the area offer an impact assessment. Shaw (2008) found the State Environmental Protection Policy - Waters of Victoria as the only plan producing a major change in environmental concerns as a result of a strategic plan. A lack of explicit environmental objectives in strategic planning has been identified. Examples of strategic plans that provide visionary pictures of development for 15 to 25 years in advance are Urban Development Frameworks on the eastern coast of Victoria. The implications of a lack of explicit environment objectives in these plans may extend for long time periods (Shaw 2008, 2010).

1.5.2 Spatial links- Ecological techniques

Spatial components linked to ecological techniques would require ecosystems to be identified and data provided on recommended levels of protection. Shaw (2010) found that it is questionable, whether the existing natural resource data, models and assessment tools available for coastal issues on the eastern coast of Vitoria are being used to their maximum effect. The Commonwealth's Resources and Assessment Report of 2002 is an extensive resource on catchments, estuaries and rivers in Australia. It includes models of estuaries and catchments that are also reflected in extensive state databases. Given the lack of environmental issues explicitly expressed as objectives in plans, the resource data, scientific papers, models and predictive material may be underutilized (Shaw 2010). Ecological Vegetation Classes (EVC)s for vegetation developed in the 1990s and extended over the state of Victoria to assist with biodiversity and adaptation to change have largely not been used in existing strategic plans for the coast in eastern Victoria in 2008 (Shaw 2010). National Parks and other types of reserves and parks are based on techniques, such as surveys and Land Conservation Council (LCC) reports, used to measure the spatial extent and values of environmental components.

1.5.3 Thresholds and feedback loops linked to legislation

It is of note that the only plan analysed by Shaw (2008) that achieved environmental goals over time has been the State Environmental Protection Policy - Waters of Victoria. This framework has been declared since 1988 with stated objectives and focused monitoring over time. Associated water quality levels that match to designated uses of the water have been continually refined since 1988. These levels provide levels that if reached prompt investigations and actions (Environmental Protection Agency 1988).

1.5.4 Advocacy

There is little information on advocacy for the environment for coasts on the eastern coast of Victoria. There has been a fair amount of unrest and discontent with large public meetings where many have been vocal and unsatisfied both by the level of development proposed and the likely impacts of coastal planning decisions on their coastal lifestyles (Wescott 2012). Widespread community opinion to have a section

of the eastern coast protected is reported by Chapman (2006) in the led up to the declaration of the Bunurong Marine National Park.

1.5.5 Knowledge management

As discussed above in the description of Knowledge Management, it is questionable whether attention has been given to the use of extensive knowledge management techniques in natural resource management. Shaw (2010) questioned the linkages between existing natural resource data, models and assessment tools and strategic planning in Eastern Victoria. In particular, suggesting that the resource data, models and predictive material may be under-utilized if there are a lack of explicitly expressed environmental objectives in plans, forcing practitioners into a more reactive than proactive approaches (Shaw 2010).

1.5.6 Insights from the pre-test

Preliminary results when applying the criteria to a small area of the Australia's coast show some interesting results when focusing on environmental governance. This appears to open some areas up for exploration with criteria that are theoretically important to governance.

The key point of the desktop study of Victoria's eastern coast to test the criteria is summarised as following. The study shows that at least one of the criteria, environmental objectives in strategic planning, are not well represented and begs further questioning of environmental governance of coastal areas in Australia. This questioning will be further addressed in Chapter 5 where three case studies, in other areas of coast will be analysed in a similar way to the desktop study of Victoria's eastern coast. These case studies are detailed one by one in the following three chapters and a chronological narrative provided on each. These detailed chronological narratives provide the substance to assess if the environmental program goals are met and due to focus or use of the criteria in the framework. Deeper analysis of environmental governance and the environmental governance framework is detailed in Chapter 5.

1.6 Conclusions

This chapter has explored and elaborated the concept of governance and its more specific variant, environmental governance, and utilised the latter to develop a framework for further analysis that will be applied in the following chapters. The concept of governance has advantages for managing the environment, however environmental governance has yet to demonstrably achieve consistently beneficial environmental outcomes. Linking management theory with natural resource management, the framework places increased attention to the delivery of environmental goals.

In summary, the important aspects of this framework are:

- Environmental objectives explicitly stated in strategic planning that set the direction of effort.
- Clarity provided to environmental governance decisions by the determination of spatial area requested for the environment and the ecological techniques that support this determination. This criterion contributes to all the elements of environmental governance in Table 1. Given the importance of this criterion to environmental governance, it is important to focus this work on the point where the negotiation between human use of the resource and the environment is taking place.
- Thresholds and feedbacks loops have the capacity to provide greater transparency in environmental governance, especially if thresholds are triggers for action. In the absence of thresholds and feedback loops, monitoring may provide information for further management and policy (World Resources Institute 2003, 188).
- The important aspect of advocacy to met environmental goals is to separate advocacy as it is defined above from public participation in government process. Explicit attention to incorporating advocacy objectives provides an explicit voice for environmental outcomes. There is evidence that both environmental education and communication programs are effective mechanisms in biodiversity conservation and sustainable use (Millennium Ecosystem Assessment 2005, 124). Advocates may use these techniques,

along with a variety of other techniques, such as campaigning and media. The success of achieving environmental goals with individual techniques has largely not been documented in the journal literature.

- Knowledge management offers a number of advantages and techniques that if used, would propel movement towards environmental goals. At its most basic level, knowledge management addresses whether public funded research has been applied and used to achieve environmental goals across governance frameworks.

This framework represents a logical approach drawing on management, conservation biology, natural resource management and public administration theory. This data has been drawn together in a simplified five criteria framework to draw attention to areas that may need lifting and remain hidden in the complexity of environmental policy problems, well documented in the literature (Reed 2008), and in fact sometimes referred to as "wicked problems".

As suggested in the introduction, analysis of empirical data from case studies through a consistent framework of analysis forms a powerful research design.

Chapter Two, a case study of environmental flows in Victoria, provides a detailed narrative of the development of key programs, noting the impact of the broader policy and political setting on the implementation of environmental programs.

Chapter Two

Case Study One Freshwater Victoria –Environmental Flows

> *In-stream uses should be taken into consideration in all water resources recommendations.*
>
> (O'Brien et al 1983, xiii)

2.1 Introduction

The concept of in-stream uses of water, defined as value for environmental and recreation uses of rivers and streams with associated 'in-stream flows" to protect these values was firmly planted in Australia in 1983 (O'Brien et al 1983, Arthington and Pusey 2003). The introduction of an idea mostly from the USA occurred by means of a major study concluding with recommendations for each state, which was necessary because of the impacts of the vastly developed irrigation industry and regulated water system of dams and storages on most major rivers in Australia (O'Brien et al 1983). The Commonwealth of Australia commissioned this study in Australia as part of the "Water to the Year 2000" series of reports, focusing on the use of water supplies, however also having the forethought to address environmental concerns (O'Brien et al 1983). These environmental concerns are considerable with fauna and flora adapted to extreme highs and lows and many species triggered to breed based on floods. At that time Australia was reported as having the most variable flows in the world (McMahon 1979). Since that time it has been debated but still acknowledged as low and variable flows and very different to European rivers. This resulted in a whole new biology being developed. Alteration of flows and flooding to regulate rivers with dams and reservoirs became so prevalent in Australia because of this reported variation in stream flows in the world (McMahon 1979, Gippel et al 1995, Arthington and Pusey 2003, The Australian Water Association 2013). Work done by McMahon (1979) suggesting that these flows may be the most variable in the world has been disputed by some based on the size of catchments and

stream flows used in calculations (Brown 1983, 35). The flow regime of the Barwon-Darling River is one of the most variable in the world with low-flows punctuated by episodic flooding events that inundate the extensive areas of semi-arid floodplain (Boys 2007 in Australian Government Murray Darling Commission 2012, 7). This would still leave Australia with variability that explains the desire to build structures so that water can be supplied to agriculture and urban use in drier times. Variable flows and rainfall are reflected in historical monitoring in Australia. Conditions are thought to have been relatively wet in the 19th century, followed by drier conditions in the first half of the last century and then wet conditions in the 1950s and 1960s with two exceptionally wet years in 1974 and 1975 (Brown 1983, 33).

The effects of regulations from dams and weirs on fauna and flora are well documented (Bunn and Arthington 2002, Stewardson and Gippel 2003). The flow regime is accepted as the major determination of state of the natural environment (Poff et al 2010) and is used in Australian Government decision-making (Australian Government. Murray Darling Basin Commission 2012, 147). Australian fish species are highly adapted to flood events and variable flows that occur in rivers, without any dams, weirs or extractions (Cadwallader and Lawrence 1990, Humphries et al 1999). Attention was drawn to the importance of the flooding component of the flow regime for fish in the Murray Darling basin. Workers have now focused on other parts of the flow regime as additional requirements for biota, including in channel components (Stewardson and Gippel 2003). Other Australian fauna adapted to variable flows include duck species and invertebrates (Briggs et al 1994, Scott 1997, Bunn and Arthington 2002, Poff et al 2010). Pulse flow effects of rivers on biota were found and documented early in the 1980s leading to an increase in research around the importance of floods as a carbon input to the system (Mussared 1997, 34). In addition overbank effects of leaf litter falling from trees in the areas immediately away from the bank that later degrade to provide detritus food for invertebrates in the streams is now also well known (Thoms and Sheldon 2000). In semi-arid environments this process is dependent on flows to breakdown this leaf litter, as flows flood over the bank and onto benches adjacent to the river. The presence of bench-like structures formed by variable flows as part of the cross section of the river assist leaf litter to accumulate and get broken down (Thoms et al 1996, 46). A case example of this has been demonstrated by Southwell (2008) investigating in-channel

benches between Walgett and Bourke on the Darling River. These in-channel benches acted as sediment and nutrient sinks and an important source of dissolved nutrients. Finding 256 individual benches in two 15-kilometre reaches, it was estimated that 2179 tonnes of total carbon would have been delivered to benches over a period of 78 years (Southwell 2008 in Australian Government. Murray Darling Basin Commission 2012, 17). Recognising these connections between flow and biota, an important point became the need for environmental flows. This was related to biologists and workers in the field finding that flow is possibly the most important factor in ecosystem health of rivers and streams, and if not a major factor (Poff et al 2010).

Victorian government programs that attempted to restore Minimum Environmental Flows were commenced in 1983, with even earlier scientific work by Tunbridge at the Victorian Fisheries and Wildlife Department and Blyth at the Museum of Victoria on the minimum flow requirements for specific species (Blyth 1980, Doeg et al 1987, Tunbridge 1988). Poff et al is reported as referring to the decline in integrity of an aquatic ecosystem as the amount of alteration of the hydrology of the system from natural (Poff et al 2010, Australian Government. Murray Darling Basin Commission 2012, 22). With whole systems that operate by their adaption to variable flows and floods, complex relationships between biota and water regime exist. The flood-pulse concept for Australian floodplain rivers is distinguished from a continuum concept for many rivers overseas by the intermittent inundation of floodplains (pulse) and speculation that the carbon in these systems is obtained from river life at the times of floods. The continuum concept occurs in rivers and streams in other countries where less variation in stream flow means a continuum of inputs upstream being taken up as the river flows downstream, beginning with shredders and grazers and producing collectors and predators (Mussared 1997, 38). To consider and cater for most instream uses and values requires flows to be left in the rivers and floods to be maintained over floodplains instead of extracted. These flows are commonly called environmental flows. Shaw and Evans (1986) found that the regulation of rivers on the Murray River in relation to Hattah Lakes, caused small to medium floods over banks to be eliminated, however extremely large floods were retained as they exceeded the capacity of reservoirs that would not cope with storing these amounts.

This chapter is a chronological narrative case study covering the period from 1870 to 2013 on the work of environmental flows in freshwater rivers and streams in Victoria. The data presented in this chapter will be analyzed in Chapter Five through the lens of the environmental governance framework elaborated in the preceding chapter. The beginning of this work covers the period from 1870 up to 1983 when instream uses and instream flows began to recognized at both state and national level. To be clear about definitions, the methods to determine environmental water allocations started out in the 1980s were termed 'in-stream flows' and evolved to the name 'environmental flows', 'minimum environmental flow' or 'environmental water regimes' (O'Brien et al 1983, Arthington and Pusey 2003 ,381).

Environmental flows cannot be considered a single discrete conservation program as it consists of several different programs of work and research, including environmental flows programs, scientific studies, catchment management, healthy rivers and sustainable water and environmental management for water supplies as well as projects linked to new storage construction. In interviews professionals in this area consider their work to be environmental management rather than a conservation program (Interviewee WTXS1110-2). The work of the Australian government on development of a Murray-Darling Basin Plan will largely not be included in detail in this narrative as it targets the area of the Murray-Darling Basin in three states. The work of Professor Peter Cullen as an advocate for the environment had its roots in the Murray Darling Basin (Australia Conservation Foundation 2008). Seen as a primary supporter and advocate for environmental flows, Professor Peter Cullen also headed the Cooperative research Centre (CRC) Freshwater Ecology, with most of funding for these centers from the federal government commencing in 1991 (Interviewee WTXS1110-2) (The Australian Water Association 2013). Spokesperson for the Wentworth Group of scientists, Peter Cullen became one to the leading advocates for environmental flows (Interviewee WTXS1110-2).

2.2 History

2.2.1 The first environmental flow in Victoria

Traditionally in England, riparian rights existed if you owned land. This entitled you to take water from a stream to a " reasonable level". English streams had a surplus of water and so this concept of riparian rights was a workable solution. English streams were perennial and large. Riparian rights meant that landholders owning land, including the bed and banks of the river, had rights to take water as long as they took only a reasonable amount. Australia with its variable water supply flows was not so abundant with water supply (Rankin 2012, 268). Not only was the stream flow and rainfall variable in Australia, but the rainfall was also very limited so that irrigation was the only way grass could be grown in this country, compared to England (Nicholls et al 1997, Risbey et al 2009, Rankin 2012). In Victoria the government realised that further development of land was dependent on control over water resources, particularly after a long drought from 1877 to 1881.

Alfred Deakin, a prominent Victorian parliamentarian at the time, recognised that the public bodies would not be able to develop irrigation works and reservoirs if they didn't have control over water and if riparian rights were to take precedence (Rankin 2012). Grants of water allocation would co-exist with land rights. Alteration of the legislation would have to be in line with NSW in relation to the bed and banks, where the state also had control of these areas. The Irrigation Act of 1886 in Victoria vested the use of all water at any time, in a river or watercourse, swamp, marsh, lake, lagoon or stream in the Crown. This would stand unless someone could demonstrate a superior riparian right. This commenced the idea of head works and transfer of irrigation water many miles away. The State Rivers and Water Supply Commission (SRWSC) was formed to assist farmers to farm with the variable water supply in Victoria and lead to the Water Act in 1905 (Rankin 2012, 278).

Prior to the building of reservoirs for the regulation of rivers for the extraction of large amounts of water, other environmental issues occurred to rivers in Victoria. Further analysis of river health in the past, shows that the gold rush in the 1850s

resulted in devastating deterioration of rivers and streams in Victoria (State of the Rivers Task Force. Victoria 1987, Victorian Catchment Management Council 2013). Rabbit plagues in Victoria added further damage (Interviewee WT55671). Where some of these earlier issues have largely been addressed with rivers recovering from the damage, the issue of taking water out of rivers and stream for uses has increased steadily until recently (The State of Victoria Department of Sustainability and Environment 2010).

In the Murray Darling Basin water started to be diverted from the Murray River for irrigation schemes at Kerang Victoria in the 1870s (Mackay and Eastburn 1990, 61). Storages were progressively built and by 1980, the amount of storage of water was 28,000 gigalitres (GL) as the total storage capacity of the Murray-Darling Basin (Mackay and Eastburn 1990, 63). In 1990, the diversions amounted to between 10,000 and 11,000 giglalitres leaving 6,000 GL/year flowing down the river at the South Australian border. Most of these storages were constructed from the 1950s to 1979, which marked the completion of the Dartmouth Dam (Mackay and Eastburn 1990, 62).

Water supply was the only thing that counted in the planning of building of water storages and reservoirs up to the early 1980s (Interviewee WT887322). A common perception throughout the community was water would be wasted if it reached the sea and went out the mouth of the river. The objective was to use all of the water along the way, without considering flora and fauna needs. Recreation and aesthetic values were also not considered even though evidence through social research was starting to show passive recreation near water as having high values (Mackay and Eastburn 1990, 63). Some attention was given to "cleansing flow" to assist water quality, however these flows were considered from a water supply point of view (Interviewee WSTD45). As discussed above, the first minimum release below storage was the Thomson dam environmental release. Prior to that, in the building of the Snowy Mountain Scheme, no flows were planned to proceed below the storage in the Snowy River with more than 99% of the flows upstream of Jindabyne diverted for use in the hydro power scheme and irrigation in the neighbouring Murray and Murrumbidgee catchments (O'Brien et al 1983).

Water supply has two sources, regulated and non-regulated rivers and streams. In the first case, a reservoir is required to be built along with pipes and channels to convey the water. In the second case, water is extracted from the river using a pump with pipes to deliver where it is required. Both leave the environment without water that it would have had. Therefore to put this water back refers to "The probability of how much water is going to be there at any given time" (Interviewee WT887322). Water is currently used in two major ways, urban supply and irrigation of agriculture. Both of these uses fundamentally rely on the water from storages, named regulated supply. The physical characteristics of the geography limit the places where these reservoirs can be placed. The irrigation of agriculture in Victoria used 77% of the regulated water supply in 1996/1997 (Commissioner: The Hon Robert Webster 1998, The Commonwealth of Australia et al 2002, 20). Engineering is the major skill set that has been used to provide this water supply. In addition to civil engineers with training in dam construction; a postgraduate certificate in the provision of water supply also existed (Interviewee WT887322).

The predicament of water rights was in direct relation to the variability of the water supply, the need to irrigate land to produce crops, the requirement to have an independent storage system and the long distances to the point of delivery (The State of Victoria. Department of Sustainability and Environment 2003). The environmental effects of these storages were documented in O'Brien et al (1983) and include:

- Effects of flow
- Cold water
- Deoxygenized water from the bottom of storages.

The number of authorities that had the responsibility to build water supply structures and infrastructure, some 43 authorities, meant that the system was unwieldy, with little oversight of the holistic picture and accountability. The use of water went ahead under this system with further demands for water structures to regulate flows (Hancock 2010). Hancock (2010) outlines environmental degradation from the irrigation industry as a major trigger for reforms that came after this period (Victorian Parliament Public Bodies Review Committee 1984). Cold water and deoxygenized water became localized issues that biologists worked on but these

issues did not affect the vast lengths of rivers and streams that regulated flow issues did.

An important concept to understanding water resources is the concept of security of supply and performance of storages. Hashimoto et al (1982) argue that water storage comprises three elements:

- Robustness
- Resilience
- Vulnerability.

Security of water supply for cities (urban supply) is measured by these indicators. Therefore these three elements have become very important in arguing against environmental amounts to be left in the river. Interestingly, since this work was published in 1982, limited further work has been published on defining performance of storages, with these three indicators later combined as an indicator of sustainability (water supply sustainability) by Loucks (1997). This indicator for water supply was used especially for urban supplies (Hancock 2010). These three elements all relate to the certainty that you would expect with the delivery of an amount of water in GL. For urban water supply, this becomes very important, as a household cannot physically go without water for long unless it has alternative storage facilities. In the case of water for irrigation supplies this is less critical. 100% water security means you will get that amount with 100% certainty at the time you would like it. The more variable the stream flow, related to variable rainfall, the harder this is to achieve. The conflict between in-stream and off-stream uses is a dilemma of competing demands for water (Martin-Carrasco et al 2013, 1694).

Catchments in Victoria are divided into the Murray Darling Basin catchment and other more southern catchments. A key catchment for work in the south has been the Thomson River dam storage, where the relatively recent construction of the storage in the early 1980s enabled studies of blackfish and invertebrates with a view to implementing environmental flows. The early work on environmental flows in Victoria as described in the history above, revolved around the establishment of environmental flows downstream of major storages, especially new storages. The name at that time for environmental flows was minimum environmental flow, to

indicate the minimum that was considered to be viable for species to survive. Clear objectives were established for the implementation of environmental flows. Despite these clear objectives, the implementation was significantly less than the recommendation. In 1983 the dam became operational and a flow of 120 Ml/d in winter months downstream of the storage was implemented. This flow was downgraded in 1986 as a result of the dam not filling as quickly as predicted. A flow of 50 Ml/d in winter months downstream of the dam outlet was implemented with a Post dam monitoring program in 1986, which can be considered to be some of the first adaptive management work undertaken (Gippel et al 1995).

The interests of the Melbourne water supply were well represented at meetings where there was no question that the supply of water to Melbourne from "the storage of last resort", the Thomson Reservoir, would have clear precedence over environmental flows downstream of the storage in the Aberfeldy River. Sometimes coined the "Black Fish versus Melbourne water supply debate", these earlier studies focused primarily on the habitat requirements of single species and the flow needed to supply this. In an ironical twist, the adaptive management technique was used to keep the environmental flow much lower than what was recommended by scientists, by giving a low amount "interim flow" and then providing a monitoring program on black fish and invertebrates to see if the fauna still survived (Gippel et al 1994).

The adaptive nature of this program did not compensate for the extremely low flow that was implemented in comparison to what the scientists had recommended. Issues of reliability and robustness of the Thomson reservoir and the security of Melbourne's water supply were the reasons that the lower amounts were given to the environment. Additional information on the hydrology of the area, especially the effects of regrowth of forests, had meant a change in estimates of the filling of the Thomson storage, completed in 1985 (Gippel et al 1994). Augmentation of Melbourne's water supply by construction of further storages at an earlier time was the issue. An estimate of a four-year difference, bringing forward the need to build an additional reservoir, was a major driving force. Monitoring of black fish revealed no noticeable drop in numbers, so supporting the limited flow regime, however raising the question of the focus on single species environmental flow techniques (Langford et al 1982).

2.2.2 The 1980s – a period of review and change

In the early 1980s, John Langford was seconded from the Melbourne Metropolitan Board of Works (MMBW) to work on a State Water Plan (Interviewee WT5591). This was Victoria's response to the Water to the Year 2000 report by the Commonwealth. This State Water Plan covered four areas, with environmental flows comprising one of these areas. The other three project areas were tradable water entitlements, drinking water quality and water conservation (Interviewee WT5591).

A reform agenda was sought in the 1980s to address the degradation of the environment caused by the irrigation industry. Several parliamentary inquiries pointed to a need to increase efficiency of the use of water. This followed the observation that the State Rivers Water Supply Commission (SRWSC) was largely unaccountable and had become large, with several reports to parliament of unaudited works for water supply (Rankin 2012, 283). There were several Public Bodies Reviews with one key report in 1983. This Report recommended that the nexus between land ownership and water allocation be broken. The focus of these reports and initiation was the break down of the direct link between water rights and land ownership (Victorian Parliament Public Bodies Review Committee 1984, Gippel et al 1994, Rankin 2012).

In 1984, Dr John Paterson moved from NSW to become head of the Ministry of Water Resources in Victoria having already made major micro-economic changes at the Hunter Water Board (The Australian Water Association 2013). Prior to his arrival, staff in the Ministry of Water Resources and the State Water and Water Supply Commission (SWWSC) had heard of his reputation as a change agent. An article written by Dr Paterson had preceded him and was circulating the offices, outlining organisational change by bureaucratic storm with several references to war strategy. He believed in change by destroying organisations and committed to developing a strategy for 30 years ahead (Interviewees WTX11783 and WT5591). The Labor ministers of the time were committed to transparency and accountability. With the support of both water and conservation ministers, John Paterson had the capacity and interest to draw together all parties and individuals with ideas and products that would assist the water industry at that time (Interviewee WTX11783).

A potent characteristic was John's ability to create a number of projects and then turn this into a policy story, saleable to the government on the day (Interviewee WTX11783 and WT5591). To commence this work, he stopped all work to date at the Ministry of Water Resources and focused on the strategic projects. One of these was a project to quantify what water was currently allocated and therefore what water was left for the environment. Property rights defining what water rights users currently owned would be an important component. Sorting out the percentage allocation in each catchment, meant years of work to get a clear definition for each river basin in a water resources inventory. An economist by training, Dr John Paterson was to take a natural resources economic view to opportunity cost and the trade that may occur between water for irrigation and water for urban use and the environment. Fundamental to this view was a need to define the resource available and the pre-existing rights and entitlements that had already been allocated. Another fundamental principle to be introduced to the water industry was "pay for use." Up to this point, irrigators would pay a cost for water that included the distribution system of pipes and channels but no inclusion of the actual cost of the storage or reservoir. As seen above, with irrigation water approximately 80% of use of regulated supply, this was a considerable issue (The Australian Water Association 2013).

In addition to early scientific studies on environmental flows in Victoria, Dr John Paterson, head of the newly formed Department of Water Resources commenced ten wider projects that supported the implementation of environmental flows and conservation measures for river and streams, including catchment management in 1984. Among these projects were an Index of stream condition, a natural resources inventory and a water resources inventory (The State of Victoria. Department of Sustainability and Environment 2003, 20). John Paterson's emphasis on information was based on the premise that the likelihood of decisions being expanded to involve the wider public was dependent on the provision of knowledge on resources. Emphasis was placed on quantifying the resource, quantifying existing rights to the resource, and changes to the water legislation to allow the environment to hold a legal entitlement to water, in the case of an environmental allocation being made. A project on bulk entitlements, centred on what the individual licences already allocated would amount to in total as an amount in a storage/ reservoir (Interviewee WT5591). Theoretically, the environment could also have a bulk entitlement. These

seemly easy calculations from amount taken out of river to what this would equal in MLs in storage, took the best hydrographers many months/years of calculations, with a lot based on probabilities of stream flow and rainfall. The work was driven by John Paterson's desire to have an economic approach to water and to be able to define the resource (Hancock 2010). Debates were held on what an environmental flow would look like at any point in a stream. Fisheries and Wildlife staff including Dr Peter Jackson, a well-known dedicated fish biologist, were involved (State of Victoria. Department of Water Resources Victoria 1989). A key question discussed was, if there was a holder of an environmental allocation as a bulk entitlement in storage, who would hold this entitlement and decide when it would be released. It was generally agreed that an environmental community group would not be able to undertake this role, especially as these groups hardly had the resources to come to meetings on the allocation of water and play the environmental role. These projects provided support to environmental flows work in the future.

Some of this work was on subjects wider than the actual river and streams and included Catchment Management. In the early 1980s, there were little or no institutional arrangements for catchment management. The work that was done at this time in the form of discussion papers and workshops with River Improvement Trusts was to develop into projects on responsibility and cost sharing associated with catchment management. Before this time River management authorities looked after all matters pertaining to rivers and streams and undertook works on the bed and banks of rivers. Earlier these trusts were named "River Improvement Trusts". A lot of this work consisted of physical works to the beds and banks of the rivers to ensure stability and enable faster flows. This often resulted in structures that then had to be re-built as natural processes eroded them time after time. To the conservation bodies and scientists at that time, this was a contradiction, as the work of the Trusts included removing trees, snags and other habitat for fish and invertebrates from the rivers and streams. It was felt that catchment management would take a wider view and prevent some of the erosion occurring therefore reducing expenditure on bank and bed works in rivers and streams. This catchment management institutional arrangement was to take the river management authorities and convert them with wider catchment management responsibilities (State of the Rivers Task Force. Victoria 1987). A key example was the Dandenong Valley Authority that was created earlier in 1963 with

administration over the whole of the catchment of Dandenong Creek (Jackson and Koehn 1988).

River frontages were recognized and the management connected to property rights. River frontages in Victoria cover approximately 63,000 kilometers (with each kilometer of river covering two kilometers of frontage). 25,000 kilometers of this is owned by the crown (retained by the Crown) and 38,000 kilometers is in freehold ownership. Although 10,000 kilometers of frontage are owned only to the river bank (Miller 1974, Fletcher 1998, 123).

An advocate for rivers at this time in the 1980s was Peter Dunk who compiled the State of the Rivers Report. This pictorial document drew on historical photographs of what Victoria's rivers looked liked before and compared them to what existed in the 1980s. Contrasts were particular marked in cases like the Avon River, where silt and sand and clearing of the catchment had made a large difference by this time. Further work on catchments and the condition of rivers led to the State of the Rivers Task Force report in 1987 which John Paterson took a personal interest in (State of the Rivers Task Force. Victoria 1987).

A series of reports from the projects instigated by John Paterson were designed as A4 reports so that you could see the title on the spine if they were in a bookcase. This emphasis on hard copy reports that were usable reflected the pre-Internet era of information. John Paterson left the water industry in 1988 to become the Director-General of Human Services in Victoria (State of the Rivers Task Force. Victoria 1987). The State Rivers and Water Supply Commission and the Ministry for Water Resources had become the Rural Water Commission and the Department of Water Resources (Hudson 2003). The organisation with its major focus based around engineering solutions to provide for irrigation, had been eliminated and replaced with organisations to consider many needs and uses of water, including the environment. Issues of water efficiency and concerns about river health continued and are still discussed in 2013 (Victorian Catchment Management Council 2013). Engineers commonly designed structures to get the water away from areas as soon as possible. This was a far call from natural drainage that supplies wetlands and riparian areas with needed flows (Interviewee WT887322).

2.2.3 The 1990s – National Action on Water

The largest advancement of reform in water management at the National level has occurred through the Council of Australian Governments (CoAG) process commencing in 1992 (The Australian Water Association 2013). Central to this reform strategy was the transition to a framework of water property rights and transferable entitlements. This notion was also reflected in the final recommendations of the Public Bodies Review Committee in Victoria that investigated rural water management and recommended the introduction of a flexible system of transferable entitlements (Rankin 2012, 98, Natural Resource Management Ministerial Council 2006, 25).

A major National Water Initiative was agreed in 1994 (New South Wales Department of Environment, Climate Change and Water 2009, Rankin 2012). This followed a series of highly significant reports on water from the Public Bodies Review Committee in the early 1980s (The Australian Water Association 2013). This national report went further than recognizing the degraded nature of rivers and streams from the extraction of water and called for a river health program along with whole of catchment river management. Principles that had been called for a long time, included that polluter pays and as described above, were engaged. It was well known that irrigators only currently paid for the pipes and channels that carried the irrigation water and made no contribution to the capital cost of the storage or pollution (The Australian Water Association 2013). In particular, Council of Australian Governments (CoAG) advocated adjustments to state-based water policy objectives through agreements reached on a strategic water reform framework and more broadly through the implementation of National Competition Policy and the Hilmer Report (Commonwealth of Australia 1994, 280).

The Commonwealth and state governments of Australia agreed to CoAG's framework for water reform in 1994. It was designed to improve management of water resources and provide stability for future investment (Rankin 2012). The National Water Initiative (NWI) built on this initiative and was signed by the Australian government and all state and territory governments by April 2006. The NWI represented a shared commitment to water reform placing greater emphasis on

national compatibility in measurement and planning, including pricing and trading in water (Australian Government. National Commission of Water Resources 2013). Built around a greater level of cooperation between governments, it is easy to see that John Paterson's initiatives in Victoria were helpful in addressing these issues of accountability and trading. Possibly following some leadership shown by Victoria in relation to a mature stage of water management where allocations were now in conflict, these reforms in pricing and trading now became a priority on a nation wide basis.

The NWI sets out timelines for water plans and planning processes. The National Water Commission is an independent statuary body and provides advice to CoAG on implementation, including the undertaking of a biennial assessment of each states progress. An important role is to ensure the health of river and groundwater systems by guidelines and a pathway to return all systems to environmentally sustainable levels of use (Australian Government. National Commission of Water Resources 2013, 23). Further to this the Australian Government established a Commission for National Water in December 2004, as an independent statutory body to implement the NWI under the *National Water Commission Act 2004*. The Commission is/was made up of seven Commissioners to advise CoAG and the Australian Government on national water issues and report on the progress of implementing the NWI (NSW Department of Primary Industries 2012).

By 1994 CoAG's first water initiative (the intergovernmental agreement between the Commonwealth government and the states) highlighted principles that were different to the irrigation industry and focus by state bodies on supplying water for off-stream purposes. Opening the document is the quote: "Water may be viewed as part of Australia's natural capital, serving a number of important productive, environmental and social objectives" (Commonwealth of Australia 1994). Another highly significant component of the water initiative was a commitment to consult stakeholders on "pathways for returning overdrawn surface and groundwater systems to environmentally sustainable extraction levels" (Australian Government. National Commission of Water Resources 2013, 23).

Transparency and the separation of land titles from the ability to hold a water entitlement were also commitments by both the states and the Commonwealth (Commonwealth of Australia 1994). As one informant commented "I think the fact that Victoria has generally been very progressive in terms of water reform generally, so if you look at things like the National Water Initiative, we're quite well advanced compared to some of the other jurisdictions on a lot of those reforms. So... and obviously environmental water needs of ecosystems is a big priority in terms of National Water Initiative, so I guess that's been a good driver" (Interviewee WT11900).

At this time, the Land Conservation Council (LCC) undertook a statewide study of rivers and streams, which had been promoted by John Paterson, Director-General of the Department of Water Resources. In this John Paterson was far-sighted (NSW Department of Primary Industries 2012) and the impetus for work diminished when he left. "When John Paterson moved to another department, support for a statewide study dried up" (Clode 2006, 104). This caused some opposition to the study, but despite this the study proceeded and recommended seventeen Heritage Rivers. The Rivers and Stream study also recommended a number of representative rivers (Clode 2006, 24). The Rivers and Streams Special Investigation was undertaken between November 1987 and June 1991 (Land Conservation Council 1991, Victorian Government. Department of Natural Resources and Environment 2002). The Land Conservation Council (LCC) process allowed increased levels of community participation and education along the way (Clode 2006, 107). "The result of this investigation was a legislated system of Heritage Rivers (with significant natural, recreation, scenic and heritage values) and natural catchment areas across Victoria" (Clode 2006, 108).

In addition, the Murray Darling Basin Commission continued to work on water allocations from the time of its inception in 1917 after the signing of the Murray Darling Basin Agreement in 1915 (Clode 2006). More recently the Murray Basin Authority, which evolved from the Murray Darling Basin Commission in 2008, was charged with developing a sustainable water plan for the basin (Discover Murray. Australia's Great River 2013).

2.2.4 Bulk entitlements and environmental flows for the Goulburn River

A new Water Act for Victoria was legislated in 1989 with its foundations as bulk water entitlements, heralding an increase in certainty to users and producers. By this stage, tradeable water entitlements had been developed and were operating. Bulk entitlements were " rules if anyone else wants to develop water". A legal way for the environment to have an entitlement was also enshrined in this legislation. Some of the first work done under this new water act, involving bulk environmental entitlements, was on the Goulburn River (Australian Government. Murray-Darling Basin Commission 2012, 555). This work implementing the first bulk entitlements saw the definition of existing rights of irrigators as the first action. Unfortunately for the environment, this meant an increase in the amounts for users in some cases, as defining an amount with security of supply gave more water than they would have had in the past. The needs of the consumptive users were considered first and then the environmental flow. The reasons for this appear to be a combination of the desire to trial a system without the complication of determining environmental requirements based on a lot of science and the reduction of the public sector during the period of 1992 to 1995 (Ladson and Finlayson 2002). The Department overseeing this environmental entitlement, including staff trained in environmental science, was reduced in staff numbers by 39 in 1993 (Ladson and Finlayson 2002 , 11). It has also been documented that there was a lack of environmental advocacy involved in this decision with a committee comprising of three representatives of water supply authorities, but a lack of environmental representation (Christoff 1998, 11). This resulted in the total amount of water available to users based on historical demands by consumptive users, rather than ecological sustainability (Ladson and Finlayson 2002, 560). The water allocation remained in favor of irrigation use and production values rather than the environment (Ladson and Finlayson 2002, 564).

This work on a bulk environmental entitlement for the environment indicates that despite a system that may have a structure that allows an environmental allocation, issues like a decrease in environmental concern and advocacy resulting in a reduction of the need to specify objectives for environmental flow events can result in a decrease for the environment. Since bulk entitlements are granted in perpetuity and climate variability resulting in substantial reductions may not have been taken into

account, this may mean a decrease in the amount for the environment (Ladson and Finlayson 2002, 565). This Goulburn River case study shows that if there is no definition of the amount the environment requires for sustainability or continuation at the time when the resource is better defined for economic purposes, then environmental objectives are less likely to be met. Advocacy is shown to be important in achieving environmental goals under this system of bulk entitlements.

2.2.5 Healthy Rivers and State-wide Waterway Management Strategies

In 2002, a major strategy on River Health was launched which aimed at improving the health of degraded rivers while protecting healthy rivers in Victoria (Ladson and Finlayson 2002). The concept of Healthy Rivers and Streams was presented as something nearly all people would agree with, and the Department working in this area fitted the idea of environmental flows under this banner. Placing importance on a wider principle that nearly all stakeholders would agree with was the perceived way to sell environmental flows (Interviewee WTXS1110-2).

Victoria managed to place a cap on diversions fairly early compared to other states in Australia and at the same time introduced Stream flow management plans for unregulated streams. Under this overarching reform agenda, an interstate working group developed Principles for Healthy ecosystems at a national level over a period of four years. This process achieved a consensus by environmental professionals, mainly in public sector organizations on definitions and understanding. National Principles for the protection of Ecosystems took a considerable amount of effort and the agreement two Ministerial Councils over the period of four years (Interviewee WTXS1110-2).

Recovery of water for the environment was then considered to be part of River Health. A range of policies and planning, water recovery programs and compensation to irrigators were developed under this banner, including Sustainable Water Strategies (SWS). A report card on the River Health Program was completed in 2010 and included a report from each of the Catchment Management Authorities (CMA) (Ladson and Finlayson 2002, 10). Identification of the environmental assets of rivers and methodology to achieve these goals and objectives was undertaken (Victorian Government. Department of Natural Resources and Environment 2002).

2.2.6 Work from 1990 onwards

With the background of the Hilmer Report and the CoAG agreement, work proceeded on environmental flows in Victoria. Despite work on defining what would be needed for environmental flows from 1983 onwards, the present program considered that they had to determine what was needed to keep streams healthy. Professionals in Victoria in this area considered that there was no framework for water allocation and environmental determinations for rivers (Interviewee WTXS1110-2).

Embedding the water allocation balance decision in CoAG proved to be more important to achieving allocations for the environment than National Principles for the protection of ecosystems (Interviewee WTXS1110-2). The most important constraint was the determination of what had already been allocated to off-stream users in licences and the security of supply that this entails. This work on defining existing entitlements continued from 1983 until the 1990s to determine what water would be left in the system or bought back to make an allocation to the environment.

"Under Victoria's water allocation framework, climate change will have a greater impact on the environment than on consumptive use. The framework is set out in Securing Our Water Future Together (2004) and continues to be developed though regional Sustainable Water Strategies (SWSs). The framework takes a whole-of-system approach that considers all water for both consumptive and environmental purposes. Sustainable water strategies will maximise the outcomes from existing environmental water and identify options for water recovery" (Victorian Government. Department of Sustainability and Environment 2010 , 49).

The development of state-wide Waterway Management strategies was built on earlier attempts to develop regional Sustainable Water Strategies under the framework set out in the document Securing Our Water Future Together (2004) (Victorian Government. Department of Sustainability and Environment 2010 , 49). As one interviewee noted: "The history of environmental advocacy on flows merged out of the 1994… council was trying government's water reform agenda, where they… that's where the states got a bucket of money if they implemented reform. One of the things that Victoria acknowledged was that local environment organisations

required financial support to participate in the planning processes around those." (Interviewee WT559210). This led to an interviewee commenting, "From, probably the mid 90s the State Government resourced Environment Victoria and some other conservation organisations to participate…"(Interviewee WT559210).

Once a system for allocating water, based on existing entitlements had been devised, a series of statewide waterway management strategies were undertaken. These plans included some rudimentary objectives for environmental flows under the broad banner of Regional River Healthy Rivers Strategy. "The threshold stuff will be set through water management plans or bulk water entitlements. And also the thing that now sits across the top of those sustainable water strategies, which set across about eight regions of Victoria. And in those plans there are, we will call them thresholds where if, depending on flow or conditions around run-off, the flows change once you cross particular thresholds of run-off, dam levels and all the rest of it." (Interviewee WT559210**).**

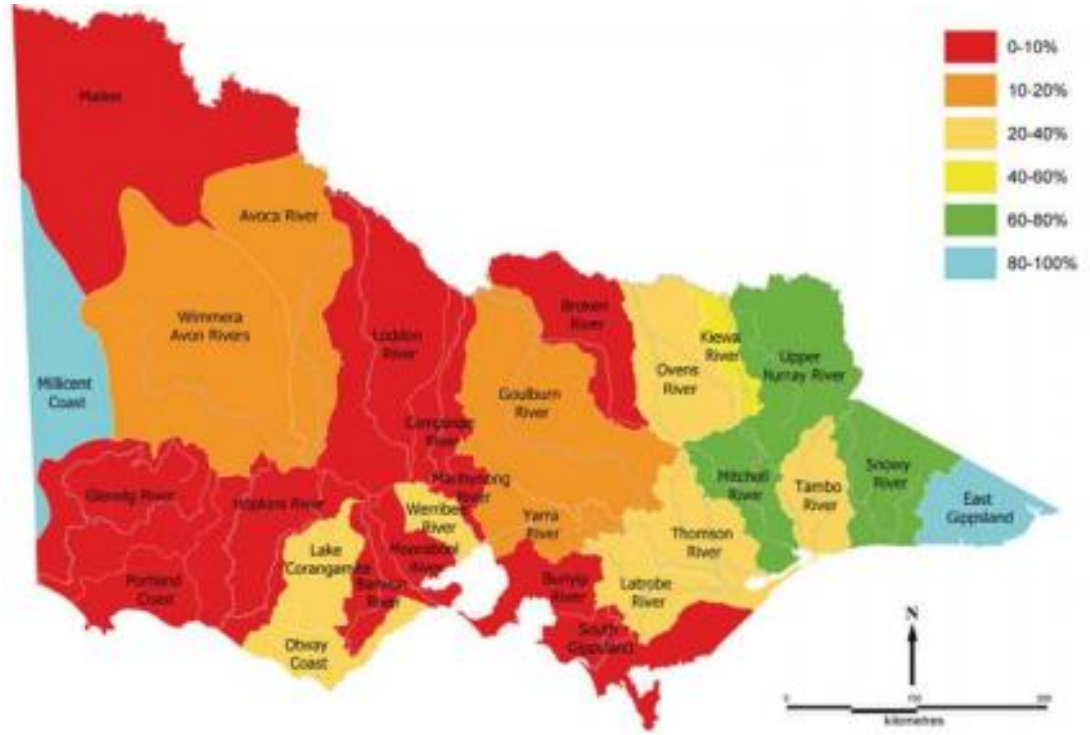
2.2.7 Regional Sustainable Water Strategies and Commitments by the Victorian government

Two major documents, The Victorian River Health Strategy (2002) and Securing Our Water Future Together (2004) set out the framework for these plans. The plans that currently deal with the amount for the environment are called Regional Sustainable Water Strategies. The current usage, projected demands, transferable rights and environmental flows are all considered in this (Victorian Government. Department of Natural Resources and Environment 2002).

The determination of what the river or values need in terms of the probability of water at a point methodology is now consistent across the state. These amounts have really only been implemented with an allocated holder of water for the environment recently in 2011 (Victoria. Department of Environment and Primary Industries 2014). Techniques developed to determine environmental flows include a method by Tennant (1976) in the United States and the US Fish and Wildlife Service, and include field habitat, hydraulic and biological data. It links different percentages of average or mean annual flow (AAF/MAF) and different categories of river condition,

on a seasonal basis, to usable area available to species such as fish. Tharme (2003) reports at least 25 countries have either applied the method as originally designated by Tennant or in a modified form. For instance, Spain uses specific percentages of Mean Annual Flow (MAF) to set environmental flows at 10% MAF for some river catchments (Docampo and De Bikun˜a, 1993 in Tharme 2003, 409). A routine application of 2.5–5% MAF is applied in rivers in Portugal (Alves and Henriques 1994 in Tharme 2003, 405). Figure 2.1 shows the assessment done by the Victorian government to show areas with a remaining stream length with flow regime in good condition (Commissioner for Environmental Sustainability Victoria 2008, 42).

Figure 2.1 Percentage of stream length assessed with flow regime in good condition



Source: (Reproduced with permission, Commissioner for Environmental Sustainability Victoria 2008, 42)

2.2.8 State Environmental Protection Policies (SEPP)

At the same time as these developments on water quantity for the environment, the development of policy for water quality received considerable effort in Victoria. Water Quality associated with rivers and streams are subjected to State Environmental Protection Polices. Beneficial uses in each catchment are agreed as objectives to be kept and a level of water quality is defined as a requirement to retain that specific beneficial use (The State of Victoria Department of Sustainability and Environment 2009, 21). This system has been operating since 1988 when it focused on point discharges (The State of Victoria Department of Sustainability and Environment 2009, 22). Now a boarder system focusing on all types of runoff, including diffuse sources of pollution in a catchment management context has been implemented (The State of Victoria Department of Sustainability and Environment 2009, 21). A community program to assist in monitoring water quality and raise awareness, Waterwatch, has been operating since 1988 and is now connected to catchment management and Catchment Management Authorities (CMAs).

2.2.9 Emphasis on long-term resource condition

Building on the earlier Natural Resources Inventory, a visual pictorial of key indicators on health of both rivers and their catchments, including riparian vegetation, has been developed. There has been increasing emphasis on monitoring of the long-term resource condition. A statewide assessment of river condition was produced (Victorian Government. Department of Natural Resources and Environment 2002). Monitoring the condition of rivers and streams has been based on Macmillan's (1987) techniques, which were subsequently modified by Meredith et al (1989), with slight modifications (Fletcher 1998, Government of Victoria. Environmental Protection Agency 2003). This is to include estuaries and wetlands in 2013. The first index of wetlands condition was completed in 2012. Other reporting includes 5 yearly assessment for the Catchment Management Authorities (CMAs) (Interviewee WS134778).

2.2.10 Finally a Victorian Environmental Water Holder

The Environmental Water Reserve (EWR), introduced by the Government in 2005, provides legal recognition of the amount of water set aside to provide environmental benefits to water-dependent ecosystems. The EWR is comprised of three types of water: callable volumes in storage (entitlements), which can be released from storage by an environmental water manager to meet specific environmental needs; rules-based water such as passing flows; and rules-based, above-cap flows, which are released from storage, or made available to the environment by a storage operator or licensing authority (Government of Victoria. Environmental Protection Agency 2003, 27).

A body to hold and decide the technical detail of where to use an environmental allocation was established in 2012, following further changes to the water act to formally give legal powers to the organisation, Victorian Environmental Water Holder. The Environmental Water Holder puts out an environmental water booklet reporting each environmental allocation and the benefits from this allocation. As the government reported: "Significant volumes of environmental water have already been recovered and future water recovery projects are likely to substantially increase this volume. The Victorian Government will invest in major water recovery projects for the environment through water savings generated by infrastructure improvements. This includes 75 GL as part of the Northern Victorian Irrigation Renewal Project, 83 GL as part of the Wimmera Mallee Pipeline Project and 7 GL as part of the Macalister Irrigation District 2030 program"(State of Victoria. Department of Water Resources Victoria 1989, 9).

As an interviewee noted "Yes, there are substantial amounts of water that have been returned to Victoria's river systems. Our, you know the question: are those volumes sufficient to protect and restore those river systems? The answer would generally be no. But is it a substantial improvement on what was there ten or 15 years ago, the answer would be yes. It depends on the river system but rivers like the Thomson, rivers like the Yarra, rivers like the Victorian Murray, Goulburn, the flows being detected in the Ovens River, there have been substantial improvements in the environmental flow regimes of Victorian rivers over the last ten or 15 years"

(Interviewee WT559210**)**. The totals of the Victorian Government's commitments for Environmental Water Reserves are seen in Table 2.1.

Table 2 .1 Proposal to improve the Environmental Water Reserve in Victoria's major systems).

Major River Systems	Estimated long term average water in GL recovered completed project (GL)	Potential long term average water in GL recovered committed project	Other pertaining to this River System
Wimmera & Glenelg	34.69 (2003)		
Loddon	3.1 (2007)	7.0 (2010)	
Campaspe			
Goulburn	192.3 (2009-2013)		
Broken			
Murray	120.0 (2004-2007)	82.0 (2009-2013)	
Ovens			Improved flow regimes provided through the water allocation framework
Macalister		7.0 (2011)	
Snowy	21. 7	37.0	
Thomson	10*	8.0 (2011)	
La Trobe		10	
Tarago		3.0 (2008)	
Yarra	20*		
Maribynong		3.0*	
Werribee		6.0*	
Barwon & Leigh		4.7*	
Moorabool		6.0*	
Lerderderg			Improved flow regimes provided through the water allocation framework
Total	401.79	173.7	

*Committed Delivery will be delayed due to drought.

Note: River Murray allocations shown are Victoria's contribution only
Source: adapted from Commissioner for Environmental Sustainability 2008, 381, Department of Sustainability and Environment (DSE) 2008.

2.2.11 Water Authorities met their obligations

Authorities, that report to state authorities, like Melbourne Water, have a policy and legislative framework that requires Melbourne Water to deliver environmental flow outcomes. Melbourne Water has an area of responsibly over the Port Phillip and Westernport catchment. Once an organisation that had responsibly for water supply, sewerage and drainage, this was broadened to "caretaker of river health" in the 1990s (Fletcher 1998, 9). Associated with Melbourne Water and environmental flow delivery in their area is the advocate group, The Yarra River Keepers Association. There is some evidence to suggest that Melbourne Water have now taken their responsibilities further than some other state bodies, due to staff enthusiasm and further know how and a culture of innovation (Interviewee WT559210**).**

2.2.12 New integrated strategy – rivers, estuaries, wetlands

Work in 2013 began on a strategy for Victoria for rivers, estuaries and wetlands as one integrated document. Consideration is being given to less dependence on major engineering structures as the primary means of supplying water to major cities, because of the resilience factor that major storages may not fill. More sustainable and robust solutions are being sought. "A major driver will be security of supply for water, especially for the city of Melbourne. Largest driver than any environmental need." (Interviewee WTX11783). Other developments include funding cuts to programs and commercialization of wildlife and fisheries research. As one interviewee noted "And with that comes funding cuts, so Native Fish Strategy's gone; it's had… it's taken up 13 years of my life; it's been a great success and it's gone, it's cut, finished at the moment. This bit that I'm writing here is actually a paper to go in a volume that will be part of the legacy" (Interviewee WT9974). They also commented that " The native fish programme… Yes, it was… It's not actually commonwealth money because it's state's money going into the Murray-Darling Basin authority, and then coming back out. And so that's where it's fallen down because New South Wales pulled their money and now South Australia has and so that whole thing's collapsed." Interviewee WT9974.

" One of the real issues is in the last five years research and knowledge in the water area has dropped dramatically. So I said over the 30 years our knowledge has

increased, so since Land and Water Australia has gone, now the Native Fish Strategy has gone, the Sustainable Rivers Audit which is monitoring has gone. So I think we worked out there is about $70 million a year worth of R and D type money that's just dropped off probably only in the last three years. And so there is a major gap in terms of capacity and ability to keep going with knowledge stuff that will support environmental flows and fish for that matter. So it's a pretty major change." (Interviewee WT9974).

Increased pressures on the water resource since the 1980s are increased water use combined with decreased water availability from climate change and plantations of trees (Interviewee WT9974). Efficiency of water use has also been a major trend. "There's been a lot of efficiencies as well, so that's meant decreased runoff back into rivers, so now… I reckon in the 1980s, say you had 100% of an irrigated bunch of water, I reckon you'd get maybe 20% of that back owing to the fact that they wouldn't use it or they'd overuse it and it would run off and all that sort of stuff. Or there'd be leakages in the system or they didn't account for it properly or whatever. There's none of that now." (Interviewee WT55671).

2.2.13 Assessment of the Environmental Flow Programs in Victoria.

The Victorian government has been reported as leading Australia in environmental flow management, although possibly with other states now catching up (Interviewee WT445890). The actual amount of water allocated to the environment is difficult to quantify as the base line from where the measurement is commenced is important. Of significance is 402 GL of water that has been bought by the Victorian Government and reallocated from extractive use to the environment. This significant amount of water for the environment does point to a level of performance of the program or environmental management in this case. The documentation of the amount of water allocated for the environment is detailed in the Victorian Water Register. Some successes have also been recorded for Hattah Lakes and the Barmah forest wetlands that are significant wetlands in National Parks (Victoria. Department of Environment and Primary Industries 2014).

At the Commonwealth level, the Murray Darling Basin Commission commenced the Sustainable Rivers Audit across the Murray Darling Basin that gave an assessment of

both fish and invertebrates. This detailed work at a species level is a repeatable methodology that could be used to monitor trends into the future, however this program had a funding cut in June 2013 due to not all states being willing to continue supplying funding (Interviewee WT9974). “One of the best State of the Environment things has been the Sustainable Rivers Audit which has been conducted across the Murray Darling Basin, and also rolled out into coastal Victoria as well.” (Interviewee WT9974).

Interviewees were asked whether the program or environmental management met its stated objectives. Results from interviewees are that environmental flow programs in Victoria have a level of performance as indicated by water allocated to the environment worth millions of dollar, however that use has also increased. “There is an acknowledged large increase in use of irrigation water. Since the 1980s, so while all this work on institutional arrangements and technical work on flows, there has been an increase in the use of the resource”(Interviewee WT9974). This case study also shows the length of time taken to reach consensus on principles and overarching policy, both institutionally and environmental and including the healthy rivers policy and frameworks. Thirty years on from the instigation of work to develop environmental flows, implementation of some flows over the whole of Victoria is at a level that is well below what scientists have suggested as minimum levels.

This is borne out by the recent Victorian State of the Environment Report in 2013, concluding that “in many rivers and aquifers the current Environmental Water Reserve (EWR) is inadequate and vulnerable, placing environmental values at risk”(Commissioner for Environmental Sustainability Victoria 2013, 129).

Chapter Three

Case Study Two Wetland Conservation in Victoria

The Land Conservation Council (LCC) was established and operates in accordance with the Land Conservation Act 1970. It is a statutory authority and its major role, as defined by the Act, is to carry out investigations and make recommendations to the Minister with respect to the use of public land in order to provide for the balanced use of land in Victoria. In framing its recommendations on public land use, the Council is required to have regard to the social and economic implications relevant to the recommendations. Initially, the State of Victoria was divided into 17 areas or districts for the purpose of the LCC studies. The boundaries of these areas were chosen on various criteria, the end result in most cases being similar to bioregional boundaries. The areas differed widely in the amount of public land: at one end of the scale there is East Gippsland with 88 per cent public land, at the other end Murray Valley with nine per cent (38.5 per cent of Victoria is public land). Commencing in 1971, each of these was studied and recommendations made to the Government for more than 20 different categories of public land use, including reference areas, wilderness areas, national parks, forestry, agriculture, community use and services. In the 24 years of its operation, Council has provided over 6,400 recommendations to Government. A measure of its success is that, of the 5,745 recommendations which have been subject to Government decision, only 131 of these have not been accepted, while 104 have been varied (Saunders 1996 , 129).

3.1 Introduction

Environmental governance as it applies to wetlands is based on their categorisation as public or private land. The Land Conservation Council (LCC) has been the major influence on public land in Victoria from 1970s onwards (Saunders 1996, Clode 2006). Wetlands on private land are subject to many threats from land management and agriculture. They are largely at the discretion of the landholder and subject to planning schemes, including state and regional strategic plans. Some wetlands declared as public areas are surrounded by private land from the water's edge, which can impinge on conservation values if these private land areas are developed. In Victoria, over 90% of the area of wetlands lost has been on private land (Holmes 2001).

The importance of wetlands to biodiversity in Victoria is large, providing a high rate of nutrient cycling and habitat for numerous species (Department of Environment and Primary Industries 2013). Documented are the intrinsic values of biodiversity as food webs and sources of primary production, as well the value to mankind for all types of medicine and other extracts from species, some of these currently unknown (Mussared 1997). Over 100 species of waterbirds use wetlands in Victoria, with a varied and distinctive flora (Department of Environment and Primary Industries 2013). Eight hundred and forty-one species of vascular plants have been recorded and one hundred and sixty-four species of vertebrates (Holmes 2001). Coastal wetlands provide extremely useful ecosystem services and Boon (2012) has put these services as 'of considerably greater value than those provided by an equivalent area of inland wetland' (Bateman et al 2011, Boon 2012, 846).

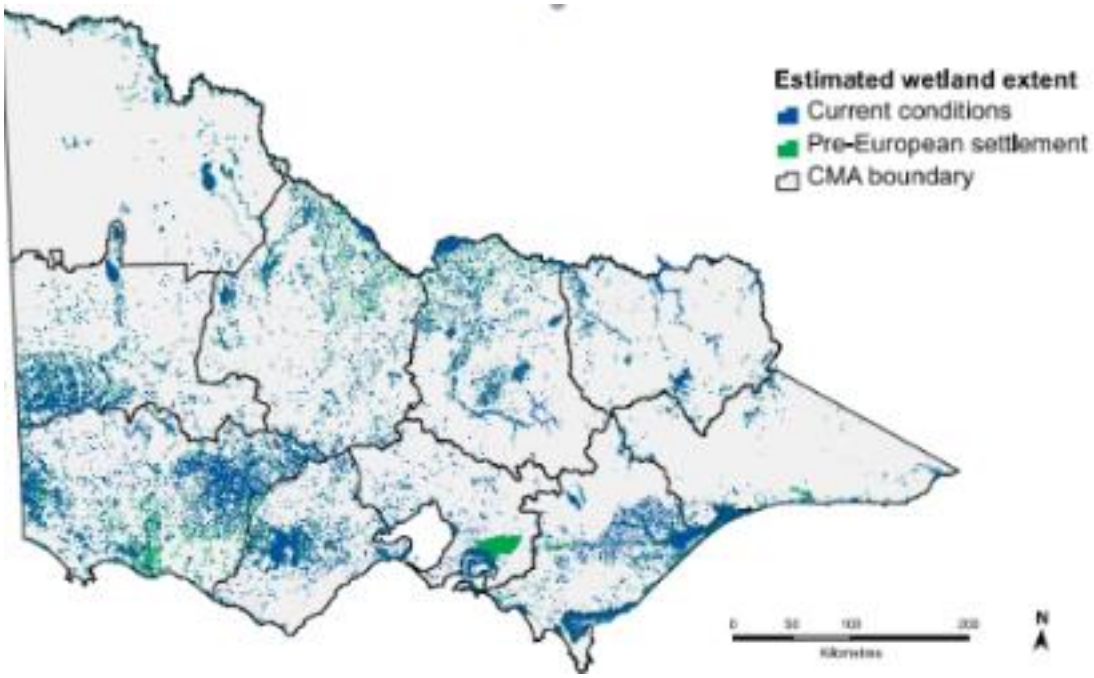
This chapter provides a historical narrative case study of the management of wetlands in Victoria, concentrating on the work done to enhance their conservation and preservation. This case study covers the period on wetland work in Victoria from early indigenous uses to the present. Particular attention is given to the period from the 1970s to the present day when significant programs and initiatives, driven by increased international attention to conservation of wetlands, were introduced. This case study covers a wide range of activities affecting Victoria's wetlands from defined government programs to operational management that address threats impinging on the environmental values, for all types of wetlands from shallow freshwater to estuaries.

3.2 History

There are over 13,000 wetlands in Victoria greater than one hectare in size, ranging from shallow freshwater to coastal estuarine inlets (Holmes 2001). Ranging in size from a fraction of a hectare to large wetlands like Westernport Bay, comprising 680 square kilometres, wetlands are seen as valuable primarily for their diversity and ecosystem values (Kellogg Brown & Root 2010). In some regions such as the Glenelg catchment in South-west Victoria, wetlands comprise as much as 11% of the catchment (Interviewee WS1126765).

Figure 3.1 shows the wetlands in Victoria's catchments prior to European settlement. Overall wetlands now make up 2% of the area of Victoria. Prior to European settlement 37% of the wetlands that existed have now disappeared primarily due to drainage for agriculture (Holmes 2001).

Figure 3.1 Wetlands in Victorian catchments prior to white settlement and the current extent of wetlands.



Source: (Commissioner for Environmental Sustainability Victoria 2013, 137)

3.2.1 Early use of wetlands – Pre-European settlement

Indigenous use of wetland areas prior to European settlement has been extensive, for both food and shelter. Aboriginal sites near wetlands include middens of shells left as a result of shellfish that have been consumed. Fishing was also prevalent across freshwater, coastal and estuarine wetlands that teamed with life. Evidence of large aboriginal settlements, including settlements at Lake Condah in Victoria's southwest, as well as extensive use of the Murray tributary wetlands has been documented (Victorian Environmental Assessment Council 2006, Victorian State Government Department of Transport 2013, 188). Wetland species used by indigenous people include freshwater crayfish, eels, frogs, water rats as well as an abundance of fish species. Cumbungi and reeds were used extensively for baskets and containers, along with roots from water based plants and yams as sustaining food. Evidence of aboriginal cooking hearths were noted by the explorer Mitchell in 1836 near the now well known Kerang Lakes wetlands of Lake Boga, Lake Tutchewop, Lake Kelly, Lake Charm, Third Lake, Middle Lake and Reedy Lake (Ballinger 2008, 8).

3.2.2 Early Loss of wetlands – Drainage schemes

Early European settlement was focused on drainage and the establishment of agriculture. Drainage programs, including soldier settlement programs, meant the draining of wetlands including the Koo-Wee-Rup swamp, a large wetland with drainage to Westernport Bay. Work began as early as 1889 on the Bunyip main Drain and in 1917 the Lower Koo-Wee-Rup Flood Protection District was proclaimed (Roberts 1985, Department of Environment and Primary Industries Victoria). An added reason to drain swamps was the infestation of sheep with liver fluke that breed in wetlands (Interviewee WS1126765).

By the late 1970s, a loss greater than 30% in wetlands was reported and attributed to European settlement and development (Department of Conservation Forests and Lands Victoria et al 1988). In 2013 the Victorian state of the environment report stated that 4000 wetlands have been lost in Victoria, with a reduction in wetland area estimated to be 200,000 hectares (Commissioner for Environmental Sustainability Victoria 2013, 138). The figures in the 2013 State of the Environment report are founded on data from 1994 and earlier, with a comment that expert opinion suggests

that wetlands in Victoria have decreased even further since this time (Commissioner for Environmental Sustainability Victoria 2013, 138). A primary data source has been mapping of wetlands for waterbird habitat by Andrew Corrick at the Arthur Rylah Research Institute, Department of Sustainability and Environment (Corrick and Norman 1980, Corrick 1981, 1982). In 1992 a report looking further at Andrew Corrick's survey and summarising losses was undertaken by the Shelley Heron from the Office of the Environment in conjunction with the Department of Conservation and Environment (Department of Conservation and Environment and Office of the Environment 1992). This was some of the earliest work compiling data in useable form for decision-makers and policy officers in government. This work showed a large percentage of wetlands on private land have been lost (90% of the wetland area that was on private land) with a considerable amount of assistance from government schemes to assist drainage and settlement of the population (Holmes 2001, Commissioner for Environmental Sustainability Victoria 2013). This loss of wetlands early in white settlement left a large legacy not surpassed until recent laser grading and other agricultural pursuits that are currently having large effects on wetlands (Interviewee WS1126765) (Department of Conservation Forests and Lands Victoria et al 1988).

To protect rural land from further damage from flooding, rural drainage schemes were established over the last 150 years with the expectation by landholders that maintenance of these schemes would be provided as an ongoing service from government, especially in the south west of Victoria (Interviewee WS1126765) (Department of Sustainability and Environment Victoria 2013). There are drainage schemes in the west of the state of Victoria covering an area of 200,000 hectares. The Department of Sustainability and Environment Victoria has calculated the existence of over 30,000 km of rural drains across Victoria that are outside of irrigation areas or towns. This consists of between 130 and 150 drainage systems across Victoria, the majority of which are on private land, covering 1 million hectares of predominantly agricultural land. There is current pressure to find the funding to maintain these drainage schemes, with associated effects on wetlands. Historically these schemes have been funded by a combination of private and public funding (Interviewee WS1126765) (Department of Sustainability and Environment Victoria 2013, 5).

3.2.3 The 1880s onwards: Irrigation and the associated effects of salinity on Victorian wetlands

In a similar way to the flooding required for natural fauna and flora associated with rivers, wetlands also depend on wetting and drying cycles. Sue Briggs and Tim Mahor in NSWs were some of the first researchers to highlight the need for flooding of wetlands and the associated triggers for waterbirds to breed (Mahor and Carpenter 1984, Briggs 1988, Briggs et al 1994). For instance, most waterbirds in the Murray-Darling basin were found to breed following wetland flooding with only two species breeding at times showing that they are largely unaffected by water level or wetland inundation (Briggs 1990, 337). Threats to wetlands were caused from altered watering regimes to provide for irrigation and associated effects of salinity in Northern Victoria (Briggs 1990, 337). These changes commenced as early as 1886 with the River Goulburn Weir Act and construction of smaller weirs and channels (Close 1990, Macumber 1990). Reservoirs like the Sugarloaf storage was constructed in 1918 on the Goulburn River as the predecessor to Eildon Reservoir completed in 1927 with a storage capacity of 3,400 GL (Shaw and Evans 1986, 241). Irrigation schemes were influenced by Spain and California to name only two influential countries (Ballinger 2008).

The reservoirs outlined in Chapter two, built from the 1930s onwards, led to an increase of water put onto the land by irrigation schemes and a rise in the level of the ground water as this water leached down to aquifers. Salt in these aquifers rose to the surface with the higher groundwater tables, therefore affecting surface water with salt. Many wetlands in the north of the state were affected, with the most obvious the conversion of terminal lakes, where salt accumulated on a continual basis into an evaporation basin. Lake Tutchewop, a previous favored waterfowl habitat and a recreation area equipped with bathing boxes at the turn of the century, was turned into an evaporation basin fed by the saline drainage water of Barr Creek to prevent the saline water going into the Murray River. This creek has been previously named Moonlight Creek by the explorer Mitchell in 1836 (Ballinger 2008). Interviewee WS7789 indicated that pressures from the Victorian Field and Game Association (VFGA) about these issues led to a Kerang Lakes study and survey by Andrew Corrick in 1970s (Ballinger 2008). These effects on wetlands commenced community thinking about wetland degradation, especially about the effects on

game. This survey on waterbird habitat and mapping was to prove very useful in many ways in the future and utilised aerial photography with ‘ground truthing’ observations (Interviewee WS1126765). Evaporation basins established in the north of the state were a source of ministerial inquiries from locals in the area, visitors and hunters of waterfowl, as an obvious point of environmental degradation (Interviewee WS1126765). Further attention and publicity was gained on the effects of salinity in the 1960s and in 1968 this issue and its effects on the Murray River also reached the public (Corrick and Cowling 1975).

The effects of saline water on flora and fauna were uncertain for many years, with a lack of research data. An early report by Barry Hart in the 1980s was a summary of what was known to date for different species and highlighted gaps in knowledge. This was refined over the years to become a comprehensive report by 1991(Ballinger 2008). Some of debate on the effects on biota centred around the periods of extreme dry that had occurred in the past in the Murray-Darling system with some naturally occurring time periods when the river had become saline pools (Hart et al 1991). Recent work has now followed on the effects of salinity on ecosystems and species (Bailey et al 2002, Hart et al 2003).

The Salinity Program for Victoria followed the release of Victoria’s salinity strategy in the early 1980s, and attracted state and federal funding. Leading up to this strategy was a Parliamentary Public Works Committee inquiry into Salinity Control and Drainage in 1976. Also forming at this time was the Kerang Irrigation Region Salinity Action Committee (KIRSAC). Later community led panels to develop local strategies on salinity were formed in the 1980s (Walker 1979, Williams 1981, O'Brien et al 1983). An important component of the salinity strategy was working with communities to get ownership of plans at a local level, involving restructure of industries and more water efficient methods of farming. This planning was some of the first natural resources planning in Victoria where social science techniques were used. The most popular solutions involved further drainage schemes to get salt water away from valuable land and high value environments, largely paid for by government. Re-use of irrigation water and whole of farm planning are also reported as solutions during this period (Ballinger 2008).

At this time, salt started to be considered in the same way as other water borne pollutants in the 1970s and this evolved into a sophisticated system of allocations of salt pollution (credits) to areas aimed at protecting the environment and the water supply to South Australia (Ballinger 2008). This system of salt credits where salt was treated as pollution with licences for amounts of salt was devised with Victoria and NSW working together. South Australia was considered a receiver of salt in the Murray River and agreements between three states on the amount of salt that South Australia would receive at a point were devised with the Commonwealth overseeing. A salinity wetland officer, Colin Leitch, was appointed in 1985 and completed a number of strategies especially devising channels for salt water to go around high value wetlands. Further restructuring of rural industries has continued in 2012 with a large emphasis on water efficient techniques (Mallee Catchment Management Authority 2012).

3.2.4 Hunting on wetlands – Legacy for the future. 1950s onwards

The preservation of a number of key wetlands is linked to the recreational activity of duck hunting and fishing in the 1950s. Increases in waterfowl, including duck species, have been found to be associated with flooding and inundation of wetlands. Work by Sue Briggs, as seen earlier in this chapter, established the primary food sources linked to wetland wetting and drying cycles (Mallee Catchment Management Authority 2012). The Victorian Field and Game Association (VFGA) took up the cause of the decline the Pacific Black Duck (*Anas superciliosa*). Raising significant funding, the VFGA purchased 54 reserves, which became Field and Game reserves. Four of these areas are now nominated as part of the international agreement, the Ramsar convention. In 1978, the VFGA received a prize for their conservation efforts (Briggs et al 1994, Field and Game Australia Inc 2013).

Large refuges at Serendip, Briars and Coolart were associated with hunting representing historic homesteads with hunting lodges and centered around habitat for waterbirds and ducks that would be hunted. The VFGA had a very close association with the Wildlife and Game Department of Victoria with regular meetings involving the Director of the Department (Interviewee WS7789). This department had a strong identity, including its platypus logo and culture of field research.

The presence of the recreation pursuit of hunting, particular ducks and wildfowl resulted in a strong lobby group to government through the 1970s. The alliance of the two organisations, the VFGA and the Department of Fisheries and Wildlife was possible because they both had a primary interest in wildfowl research. It should be noted that many other wetland species were not addressed at the time by the Department of Fisheries and Wildlife. In particular invertebrates were not addressed, with a concentration of the limited resources on major vertebrates. Invertebrate work at a community ecosystem level was first undertaken by the Museum of Victoria in the 1970s (Yen et al 1990). This tendency to focus on warm-blooded vertebrates and give less attention to insects has recently been reported as still operating to some extent in Australia (New and Samways 2014, 26), despite work in Victoria undertaken by the Museum and universities.

3.2.5 Mangroves, swamps and a port at Hastings on Westernport Bay - 1960s

In the 1960s, proposals for a major port development at Hastings were taken to the government. The deep waters of Westernport Bay with its mangroves and swamps were attractive to bringing in large oil tankers from Bass Strait resulting in the Westernport (Oil Refinery) Act, 1963 and an oil refinery at Crib Point (Field and Game Australia Inc 2013). Given that the public at large perceived the area as a wasteland swamp, some were unexpectedly surprised at the public outcry regarding the development of this area. Wetlands, in particular mangroves, were put forward as valuable with the establishment of the Save Westernport Coalition (Barnard 2008). Known as one of the largest conservationists fights of the era, this went a long way in changing the perceived value of mangrove swamps. Conservationists showed their interest in mangroves and started to put forward their views with some evidence from scientific studies. Further development consisted of a refinery established by ESSO in 1967 and steel production by BHP in 1970 consistent with the idea of making the area the ‘Ruhr of Victoria’ by the Bolte government of the time (Barnard 2008). The Westernport Regional Planning Authority was established in 1969 as Australia’s first regional planning authority, to direct the development of the port industrial area and deal with the level of opposition from conservationists. In the 1970s, heavy industry was confined to 6880 hectares and the development envisaged did not eventuate. The legacy was a conservation movement that valued mangrove wetlands (Barnard 2008). This public interest in the area as something more than a

mangrove swamp sparked other studies, in particular a large study of Westernport Bay (Barnard 2008). After the pubic outcry over the proposed port development, mangrove swamps were never looked on in the same light, as worthless parcels of land, good for nothing swamps. The era of the wetland was born.

3.2.6 The 1970s: Changing Times and Approaches

Public interest in the environment grew in the 1970s and in particular interest in addressing the effects of pollution (Interviewee WS1126765) (Shapiro 1975). Some of this movement occurred in the 1960s with a major event in the mid 1960s consisting of a proposal to discharge effluent from a planned sewage treatment plant at Carrum into Port Philip Bay (Russ and Tanner 1978). Public outrage was the result and eventually this effluent was diverted into Bass Strait.

A promise by the Victoria's Premier, Sir Henry Bolte on the 12 May 1970 to establish a pollution control agency on the basis that he won the next election, signaled a change in the significance of environmental issues in Victoria. Winning the election, Bolte went on to pass the *Environment Protection Act* in 1970 (Russ and Tanner 1978). Overall this era represented emphasis on environmental assessment, environmental effects statements, licences and pollution in lakes and wetlands (Campbell 1978, Russ and Tanner 1978, Fisher 1980).

3.2.7 Pollution, Water quality and the establishment of the Environmental Protection Agency (EPA).

Heavy metals pollution was another topic that lead to an increase in public interest in the environment with state agencies only realising that Victoria had a heavy metal problem in late 1970s (Russ and Tanner 1978). Barry Hart, a champion of water quality, developed guidelines on water quality, including levels for heavy metal contaminants. Concerns were expressed about the Gippsland Lakes, a well-known high value wetland, and heavy metal contaminants in the Latrobe River from early gold mining activity, wood chipping manufacturing and Latrobe Valley power stations (Glover 1980, Glover 1981, Harris et al 1998, Sloane and Norris 2003). Possible accumulation of mercury in food chains with processes such as the cycling

of readily available forms of organic mercury were not well understood and added to the contention that the environment was being affected (Harris et al 1998, 27). Public interest in forestry and links to heavy metals further fuelled interest (Marchant et al 1985, 315).

The Environmental Protection Agency for Victoria (EPA) was formed in this period with overall pressure for the government to reveal the truth about the pollution state of rivers, wetlands and the air (Russ and Tanner 1978). This resulted in a number of studies on lakes and effects of pollution. The Hamer government commissioned studies into Port Phillip Bay, Westernport Bay and the Gippsland Lakes, because of the interest in the environment and in particular water quality (Shapiro 1975, Harris et al 1998, Sloane and Norris 2003). Studies also investigated a number of other lakes, including other well-known wetlands (Harris et al 1998).

3.2.8 RAMSAR convention nominations and LCC land assessment

Sir Henry Bolte retired in 1972 and Rupert Hamer took over as Premier of Victoria. With Minister of Conservation Bill Borthwick and Ruper Hamer both keen on aspects of national parks and the environment, the majority of National Parks were established from 1970 onwards with a large emphasis on the Land Conservation Council (LCC) process (Wescott 1995).

The Land Conservation Council (LCC) of Victoria was responsible for assessing and recommending to government which areas were to be public land and which category of reservation and conservation they would be assigned. As the quote at the beginning of this chapter suggests, this process in Victoria was influential and highly successful in allowing for public comment. Also known to commission scientific studies and survey, its science was credible and extensive. The work referred to above, mapping wetlands and waterbird habitat for the Kerang Lakes by Andrew Corrick at the Arthur Rylah Institute was extended to Gippsland and the Snowy River. This work became the definitive work defining wetlands in Victoria mapping in the spatial dimension.

In this case, the wetlands survey by Andrew Corrick fed into the LCC assessment rather than any additional surveys being undertaken. Considered to be credible research, this work was over extensive areas of Victoria (Interviewee WS7789). This work also included a Victorian classification system of types of wetlands for waterbird habitat with geomorphic types of different vegetation and water depth (Russ and Tanner 1978). The earlier work done on the establishment of wildlife reserves assisted conservation as a number of significant wetlands had already been reserved as public land. The later studies by the LCC of Barmah forest in 1985 and river red gum forest in 2007, added wetlands habitat as part of some new National Parks. The LCC report on rivers and streams in 1992, although addressing most of the aquatic habitat in Victoria did not include wetlands (Corrick and Norman 1980).

In the 1970s ten wetlands in Victoria were nominated and accepted as wetlands of international importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention). These wetlands were not necessarily representative of the classifications of wetlands; rather nominations were made on the best available information at the time with regard to Ramsar criteria. Three public servants undertook Australia's nominations and a list of ten well known "nice" wetlands were put forward. Andrew Corrick, Sid Cowling and Ian Hastings, Fisheries and Wildlife officers with considerable knowledge and experience, nominated the Ramsar wetlands, " nice large wetlands " in the north of the state (Interviewee WS7789). Maps of these wetlands on file were marked on paper with a thick black texa-pen line. Largely their value and their ability to met Ramsar criteria were established by the personal, expert and on-ground knowledge of the public servants. The addition of Westernport Bay occurred later in 1982 where a large amount of Westernport Bay was nominated as a Ramsar wetland. This decision built on the earlier nominations of Ramsar wetlands (Clode 2006).

The Ramsar convention obliges Australia to manage the nominated wetlands on the basis of retaining "ecological character". Notification of the Ramsar Secretariat in Switzerland is required if there are any changes to character (DEWHA 2008, Kellogg Brown & Root 2010). In recent times, the criteria for Ramsar nominations have been altered four times between 1996 and 2005 (Kellogg Brown & Root 2010). Limits to acceptable change have started to be developed with extensive work on

Westernport Bay in 2010 (Kellogg Brown & Root 2010). Interestingly a number of the factors considered for the ecological character of Westernport Bay could not be deemed as changed or not changed because of a lack of scientific monitoring data on them (Kellogg Brown & Root 2010). Corner Inlet was also listed as a Ramsar wetland in the 1970s (Monk et al 2011). Also listed as wetlands under the International Convention are the Kerang Lakes and Gunbower Forest, which both have international significance for migratory birds (Ballinger 2008, 6). This work occurred against a backdrop of Liberal government that was followed by Labor government that came to power in 1982 following the Liberal government of Hamer.

3.2.9 1982 - Joan Kirner and the Labor Government

Joan Kirner was elected into the Victorian Parliament as an MLC (ALP) in 1982 and had a significant role as Minister for Conservation, Forests & Lands from 1985 to 1988 (Heywood 2002). Joan Kirner was known as very hands on minister with a large interest in conservation and actions on the ground (Interviewee WS33787). Kirner was reported as being "honest, reliable, intelligent and in touch with people's needs" (Harkness 2013, 39).

Minister Kirner requested Sid Cowling, former Head of Fisheries and Wildlife to draft a discussion paper on wetland conservation and "Victoria's wetlands: a draft wetlands conservation statement" was released in June 1986. This discussion paper played a pivotal role, with 600 public submissions that were analysed and incorporated in the final policy and program document (Victoria. Department of Conservation et al 1986, Heywood 2002).

At the same time there was commitment by a Labor government to a State Conservation Strategy and bipartition support for conservation stemming from the World Conservation Strategy in 1982 (Interviewee WS119654). In fact the development of the Wetlands Conservation Program was a commitment of the government under the State Conservation Program (Department of Conservation Forests and Lands Victoria et al 1988, 1). Joan Kirner went on to become Premier of Victoria in 1990 until 1992.

3.2.10 The 1980s to 1992: Statewide Planning Overlay and the Wetlands Conservation Program for Victoria

The Wetlands Conservation Program for Victoria was a critical initiative. Three ministers, covering the Ministry for Conservation, Forests and Lands, the Ministry for Water Resources and the Ministry for Planning and Environment, ratified this policy and program (Victoria Department of Conservation et al 1988). The main driver for this policy was realisation of loss of about one-third of the state of Victoria's wetlands in 150 years of European settlement (Victoria Department of Conservation et al 1988, 5). This fact was borne out by a study that consolidated the survey work of Corrick and Norman (1980) to determine the percentage of loss of wetlands in different categories as seen above (Corrick and Norman 1980). The largest category of loss of wetlands in Victoria was found to be of freshwater wetlands with an up to 95% loss of freshwater wetlands in Gippsland, the majority on private land (Corrick 1981, Victoria Department of Conservation et al 1988, 5). This work was undertaken by Shelley Heron at the Office of the Environment, Victoria and took Corrick's work to a new level from a mapping and categorisation exercise to interpretation of the remaining wetlands, highlighting the amount of loss on private land. Recognition that Australia has "irreversibly altered" 50% of its wetlands in 200 years of settlement added to the impetuous to do something about wetland conservation.

Heralded as a four-year program, The Wetlands Conservation Program consisted of policy commitments and 28 actions that had the three Minister's commitment to undertake (Victoria Department of Conservation et al 1988). A senior manager, Mr Rod Gowans, wrote the final additions to the policy and a suite of actions added to the policy to make this workable. The Natural Resources Ministerial Council was responsible for the ratification of this policy. The 28 actions were divided into categories to determine which would be done in the various years (Interviewee WS1110-1). A characteristic of the Wetlands Conservation Program for Victoria was the separate chapter at the back of the report that outlined 28 actions that would be achieved over three years of the program (Victoria Department of Conservation et al 1988).

An umbrella Victorian State conservation strategy was ratified at the Premier's level and foreshadowed the Wetlands Program. The report by S. Heron compiling the data of a survey of Victoria's wetlands and further analysing this data, clearly designated the amounts of losses of wetlands within wetland categories. This work was done by the Office of the Environment who was charged with carrying out the state conservation strategy. The Flora and Fauna guarantee also pointed to the need to protect wetlands. Interviewee WS119654 remarked on the overriding senior minister and bureaucracy at this time as supportive of the environment. This across government support greatly assisted the development of the wetlands conservation program.

3.2.11 Implementing the Wetland Conservation Program

The implementation of the programs was designed around three stages:

- Collection of necessary information and expertise
- Guidelines and translation of information
- On the ground action.

Collection of the necessary information and expertise for the achievement of the 28 actions in the Wetlands Conservation Program document was commenced in 1988. A budget for each action over three years was developed and put to the Natural Resources Ministerial Council as part of the approval process for the policy document, Wetlands Conservation Program (Victoria Department of Conservation et al 1988). Approval for budget was coordinated across three government departments by the Department of Conservation, Forests and Lands. Action no 27 in the document details the establishment of a Wetlands Unit with dedicated staff to coordinate and achieve the other actions in the document (Victoria Department of Conservation et al 1988, 30). This structure and the effort to quantify action meant that the program was quantified in the achievement of actions over three to four years. "And we always knew where the money had gone. One of the very few units who actually knew where our money had gone" (Interviewee WS1110-1).

Expertise and an increase in capacity building played a part in the implementation of the program. Largely science based with the inclusion of skills in economics, planning and education, the Wetlands Unit coordinated across the research of the Department and other skills in the Office of the Environment and the Department of Water Resources. Regional coordination occurred through the establishment of a member of staff in each of the 16 regional offices of the Department of Conservation, Forests and Lands.

Employment of staff for the Wetlands Unit was sought at the highest expertise level and on all disciplines of ecology, economics, information, education and planning expertise. "I think we had an amazing set of people on that Wetlands Unit. I mean, I think we said at one stage we had four doctors, one MA, one MSc rather" (Interviewee WS1110-1).

Written technical guidelines were produced on a range of wetland management issues from grazing of wetlands to economic valuation techniques and landscape values of wetlands. At this time in the 1980s, the electronic era of the internet was not available, and these guidelines were produced as paper versions that were widely distributed to the regional offices of the Department and libraries throughout the state. Workshops for regional officers and practitioners were undertaken in the second and third years of the program following the compiling and writing of wetland manual materials. Education and education guidelines for school were also produced.

A major component in the program was the commitment to " High Value wetlands" to be protected above other wetlands. A procedure for identification of high value wetlands was documented in the program. A critical component of this was the establishment of a scientific committee and evaluation of the wetlands.

"The Scientific Committee was absolutely essential. I mean without that we really had no credibility and a lot of people wouldn't listen," " until we could say this is what the scientists are saying and this is what the data is telling us and therefore we have to listen" (Interviewee WS1110-1). Part of the program was determining water allocations for wetlands and addressing salinity impacts on wetlands. An icon

wetland for establishing water allocations was the Barmah Forest with early work by Barry Dexter, Leon Breen and later by Colin Leitch (Department of Conservation Forests and Lands Victoria et al 1988). This Barmah and salinity work focused on treating wetland ecosystems as separate systems and artificially supplying some water to alleviate effects of water regulation. In some cases, trials diverting saline water around wetlands were suggested in a series of salinity plans that involved the community in their instigation and development as part of the government's salinity strategy and plans.

The success of the program was seen as a marked increase in the value that the public and others placed on wetlands. Informant WS1110-1 commented on achievements of the program "Oh it raised the profile of Wetlands. I mean up until that time, I'm fairly certain people just hadn't thought about them as being a worthwhile conservation objective. It certainly changed people's attitudes towards wetlands and wetland management. No doubt in my mind at all. Amongst staff as well, as well as outsiders, amongst people who should have actually known better. And I'm thinking of a particular going out to one of the regions when we were doing the question and answer session on where had their money gone and what they'd actually done and what had they'd actually done to protect wetlands. And for the first time they actually had to articulate what the wetlands were, especially in Australia where there're so many empheral wetlands. When it's not like Europe where wetlands seem to have water in all of the time" (Interviewee WS1110-1).

3.2.12 Planning Scheme Amendment to the state sections

An important action under the Wetlands Conservation Program was the achievement of a planning scheme amendment for private land wetlands. Informant WS119654 refers to consultation with a lawyer at the time who indicated that it would be necessary to be able to define wetlands on a map, a description would not suffice. Using mapping from aerial photographs produced by Andrew Corrick, the lawyer indicated that the information would support the introduction of a planning control in the State Section of Planning. This introduction of the planning control was to be over night. At the last minute, this proposed overnight action to ensure that wetlands

were not destroyed before the Planning Amendment came into being saw the Minister back away from the amendment. Then the government changed or was about to change and the Secretary of the Department would not support the legislation, knowing that it was likely that there would be a change in government. These planning controls for wetlands as an overlay in the state section were never approved (Interviewee WS119654).

At the same time as this work on planning schemes, a Wetlands Conservation and Management Workshop was held in Newcastle, New South Wales in 1991 at the Shortlands Wetland Centre. The Commonwealth at this stage encouraged a number of overseas countries to be involved and financially assisted countries to have representatives attend. A player in this overseas connection at the time was the International Waterfowl and Wetlands Research Bureau. This bureau had also compiled the Oceania Wetland Inventory in the South Pacific countries.

In 1993, the production of a National "Directory of Important Wetlands in Australia" at the Commonwealth level was completed. This document was produced with contributions from all of the states (Leitch 1989). The Commonwealth funded a total of nearly $1.0m. The Australian Wildlife Fund also contributed $100,000 to this project (Commonwealth of Australia. Australian Nature Conservation Agency 1993). The idea behind the Directory was to document what was left of Australia's wetlands (Commonwealth of Australia. Australian Nature Conservation Agency 1993). The work in Victoria on a minimum data set for wetland and a state-wide assessment procedure as well as the Scientific Committee work was a good basis for this Directory.

All hard copy documents produced during the time of the Wetlands Conservation Program, including guidelines and manuals, were distributed to a list of extensive libraries through Victoria (Interviewee WS 1110 -1).

3.2.13 1992-1999: the Kennett Liberal government

The election of a Kennett Liberal-National government in 1992 resulted in funding cuts in the Department of Conservation, Forests and Lands and the end of the

Wetland unit and associated program and policy. One remaining staff member in the Department working on wetlands reflected the change to the Kennett Liberal government after the attention given wetlands by the previous Labor government. Changes to library facilities in the Department meant hard copy documents produced during the time of the Wetlands Conservation Program may not be available today on electronic information sources. Large staffing changes at his time suggests a loss of continuity in knowledge occurred (Economou 1999, 201).

The government developed a contractual model of government (Economou 1999, 194). This left bureaucrats in the conservation and natural resource areas wondering about the amount of resources required to develop and manage these contracts, which had no ongoing accountability to the environment, and were at considerable expense. Everyday public servants were decreased in number and replaced with the power of an executive government (Clode 2006, 111, Economou 1999, 201). Economou (1999, 201) records a 1418 staff number reduction from the Department of Conservation and Resources (CNR) over a three-year period from 1993 to the end of 1995 from the annual reports of the Director General (later Secretary) of CNR, Alan Thompson. Work was outsourced and the numbers of public servants massively decreased. Bodies like the LCC were restructured to suit these conditions (Clode 2006, Economou 1999).

Following the defeat of the Kirner government in late 1992, the Kennett government was known to be autocratic and neoliberal (Harness 1999). The new government went about reforming nearly all sectors of government (Harness 2013, 215). This had implications for conservation and wetlands with a decrease in political accountability and an increase in economic accounting (Clode 2006). This changed the public sector away from an independent body that would give advice. Ministers would intervene in areas that were previously only government by an independent tribunal resulting in the fast tracking of a number of projects, including the Martha Cove project on the Mornington Peninsula (Economou 1999, 210). As an example, this project meant the transformation of a pristine creek and coastal wetland in to a marina and housing development. Although this Ministerial overriding of projects was not new in the Victorian context it was considered to be now operating more frequently than before, especially on environmental matters (Economou 1999). This

move away from the republican tradition of democracy has been suggested as showing the vulnerability of the Victorian constitution (Waugh 1999, 53).
The power of the Kennett government revealed that the Victorian constitution is so open that public administration can have a lot of flexibility with changing the constitution, as long as it has the substantial majorities in both houses of Parliament (Waugh 1999, 65). Towards the end of the era of the Kennett government, regional rural people expressed their feeling that the Liberal coalition government had inattention to their requirements and had lost touch with constituent (Economou 1998). Following the Kennett government with its history of marginalization, the Bracks Government came to power in 1999. The Bracks government not thinking it would get in, and not interested in further upsetting a rural voting group, did not support the draft wetland planning controls that were still on the table (Interviewee WS119654).

Possibly building on the work and concept of Victoria of a minimum data set of information to be collected on wetlands for the Scientific Committee, the ANZECC Wetlands Network agreed in 1994 to conform to a standard format to describe wetlands included in the Directory. This format is considered the "minimum data set" for describing wetlands Australia wide (Environment Australia 2001, 12).
Another major conference was held in Canberra in November 1999. This conference was initiated by Wetland Care Australia, a community-base, not for profit organisation.

3.2.14 No governance on private land, Bracks government and catchment management

The Bracks government came to power in 1999 and stayed until 2007. This government was interested in triple bottom line that meant delivering on economic as well environmental and social goals (Interviewee WTXS1110-2).

The push for catchment management that occurred in the early 1980s was achieved with the expansion of the river improvement trusts to become catchment

management authorities. A new and expanded role appealed to some of the directors of river improvement trusts, which made the role more important. An important issue and the crux of catchment management is "who pays" and whether you could have a ratable base. This was put forward in the early days of the Brack's government and not supported since it was felt that the required 17 million dollars would be better raised through the general tax and therefore not upset the rural constitution. The only place where catchment management had a reasonable amount of funds was in the areas managed by Melbourne Water, in metropolitan and peri-urban Melbourne where a parks and reserves fee added to the general cost of supply of water. Rural landholders were not amendable to paying a catchment levy (Interviewees WS119654 and WS1126765).

The relevance of these charges to wetlands is that it highlights the difficulty of conserving wetlands on private land without additional funds provided to private landholders. In addition, there is the lack of governance for conservation of wetlands on private land since the planning permit as a state-wide amendment failed in 1985 and was not able to be resurrected with subsequent governments. Without the provision of money to compensate farmers, the right to farm on private land stands unless the present rules are changed. Even if planning permits over buildings or development on wetlands did hold, farming practices of ploughing, drainage or lack of water to these areas would still be able to proceed (Interviewees WS119654 and WS1126765).

3.2.15 Recent techniques – GPS and Groundwater survey

Global positioning satellite (GPS) imagery technology is reported as the most significant scientific technique influencing changing the ecological status of wetlands (Interviewee WT7665). More recently, the impact of groundwater survey on wetland conservation has been significant, resulting in a groundwater atlas for the state by the Southern Rural Water Commission. Prior to this data being available, groundwater areas were viewed as a two dimensional delineation on a map. Now volumetric data, including the size and extent of aquifers mean that the relationship between groundwater extraction and surface water in wetlands is indisputable.

Measurable data is taken into account when groundwater allocations are made (Interviewee WS1126765).

3.2.16 Wetland index of condition and a component of the Victorian waterways strategy

Following on from the index of condition that was devised for streams and commenced with the Natural Resource Inventory in 1984 in the Ministry for Water Resources, an index of wetland condition has now been devised and was operating in 2013. In addition, both wetlands and estuaries have now been included in the Victorian waterways strategy that had previously focused on rivers and streams.

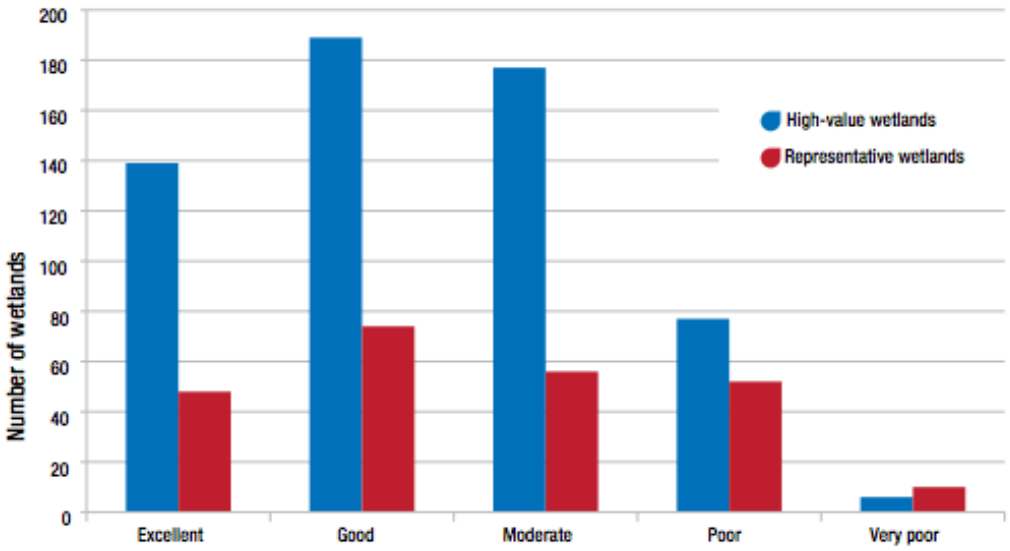
"Both wetland and estuaries have now been included in the Victorian waterways strategy" (Interviewee WT11900).

Largely an amalgamation of the catchment arrangements and authorities' commitments in their catchments these strategies detail actions that will be achieved. Catchment Management Authorities (CMAs) also have tender programs and substitution programs for wetlands on private land that consist of grants for private landholders to conserve wetlands on their land. The Commonwealth government is also involved in funding of these programs. Changes in 2013 downsizing these programs reflect economic conditions with less money available for these types of programs (Interviewee WS1126765).

3.2.17 State of the Environment Victoria 2013

Victoria's state of the environment report 2013 compiles known information on the condition and conservation of wetlands. Some of this work points to the possible translation of the Wetlands Conservation Program's (1988 to 1992) policy commitments to high value wetlands. A scientific committee assessed these high value wetlands as higher conservation status during the years 1988 to 1992, and the detailed policy commitment gave them an increase in management status at a state policy level. Representative wetlands are a selection of wetlands of the different wetland types that do not have the classification of high value. Figure 3.2 details the monitoring of these wetlands on their condition undertaken in 2013.

Figure 3.2 Condition of wetlands in Victoria as assessed by the Index of Wetland condition



Source: (Reproduced with permission, Commissioner for Environmental Sustainability Victoria 2013, 139)

An assessment of 587 high value wetlands in 2013 found that "56% of Victoria's high-value wetlands were assessed as being in good or excellent condition and 14% were in poor or very poor condition. For non-high-value wetlands, 51% were assessed as being good or excellent condition and 26% in poor or very poor condition"(Commissioner for Environmental Sustainability Victoria 2013, 128). This assessment made the conclusion that this relative high percentage of wetlands that were in excellent or good condition despite the recent drought was due to resilience of these wetlands or effectiveness of management intervention. Representative wetlands of different types without the protection and effort of high value status in the Wetlands Conservation Program, showed 51% as being good or excellent condition, 24% in moderate condition, and 26% in poor or very poor condition. "The higher number of wetlands in poor and very poor condition is most likely because threats are less prevalent or more effectively managed at the high-value wetlands"(Commissioner for Environmental Sustainability Victoria 2013, 138).

There is some evidence to suggest that high value wetlands, given upgraded conservation status and actions in the Wetland Conservation Policy have been managed along the lines suggested in the policy some twenty-six years ago and are in reasonable or slightly better shape. This is concluded in the State of the Environment Report (2013) to be either an increase in resilience or better management. This points to some possible achievement of goals of the Wetlands Conservation Strategy to give high value wetlands an increase in protection (Victoria Department of Conservation et al 1988). There is no base line data prior to the Wetlands Conservation Program to compare condition monitored in 2013. There is the work done to describe the high values of the wetlands themselves that does give an indication of condition. The work to protect high-value wetlands within the Salinity strategy in the 1980s, described above, may also have contributed to some success seen in the work of the Victoria's state of the environment report 2013.

"Many of Victoria's high-value wetlands retain their original area and form, their soils are relatively unmodified and there is no change to salinity levels" (Commissioner for Environmental Sustainability Victoria 2013, 140).

Chapter Four

Case Study Three Marine Protected Areas Program Victoria

> *In the end it took 20 years from the time there was a political commitment by a major party to a MPA system until it was realised. It took 10 of those years just to get the Government who made the commitment to a comprehensive marine and coastal study to commence the study (Wescott 2006).*

4.1 Introduction

In the cases of environmental flows and wetlands in previous chapters, protecting areas based on a number of criteria has been a strategy of conservation. Retaining biodiversity has generally been seen as desirable, protecting the survival of a high number of species. In a similar way, the goal of protecting and keeping areas of high importance, biodiversity and productivity has been the thinking behind Marine Protected Areas (MPAs), marine parks, reserves and sanctuaries.

A Marine Protected Area can be defined as: 'area of intertidal or sub tidal terrain, together with its overlying water and associated flora and fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment' (IUCN 1994, 7). More recently the contemporary interpretation of Marine Protected Areas in terms of management zones and definitions relating to acceptable forms of use, is established in Day et al 2012. This document outlines the definition of a Marine Protected Area as 'A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or other any effective means, to achieve the long-term conservation of nature with associated ecosystem service and cultural values' (Day et al 2012, 12).

The IUCN's Marine Protected Areas can be seen as one of the more clearly defined spatial ecosystems dedicated to conservation. Within this spatial area there are systems of categorization (IUCN 1994). Fishing is a major impact to the marine environment with scientists recommending bans and "no-take" fishing for Marine Protected Areas however fishing is not always eliminated within the boundaries of MPAs. There is an on–going debate regarding the amount of damage to the environment that fishing causes (Hennessey 2000, Jackson et al 2001, Beeton et al 2006, Mazur et al 2010, Syms 2011). "A recent international evaluation of ecosystem-based management in fisheries found that the Australian system rated as 'adequate' (behind six other countries), while the New South Wales system failed" (Pitcher et al 2009, State of the Environment Committee 2011, 439).

"No-take zones" are consistent with the IUCN category II for National Parks, which permits carefully defined non-extractive human uses (Petersen et al 1998, Sloan 2002). Other types of Marine Parks listed by the IUCN comply with category V1, which refers to Managed Resource Protected Areas. These areas are designated as predominately unmodified natural systems, which are managed for long-term maintenance of biodiversity and a sustainable flow of goods and services. The only means of preservation in this category is zonation, used extensively in the Great Barrier Reef Marine Park (Australian Government Department of Sustainability 2004, Biggs 2011). Areas where intense pressure on fisheries exists, for example Iceland where 70% of export earnings come from fisheries, tend to use a multiple–use marine area classification with strict preservation zoning (Petersen et al 1998 in Sloan 2002).

Other problems with MPAs as a conservation and wilderness solution identified by Sloan 2002 are:

- Protection of areas of a large enough size that will assist ecosystems and reduce risk of non-inclusion of representative species
- Definition of desired marine ecosystem states with attendant roles for humans
- Society's underdeveloped marine environmental awareness and ethics.

Addressing these problems, a system of comprehensive, adequate and representative (CAR) has been devised to protect a range of habitats and communities in each

region. The principle of this system is to establish a MPA that is large enough to deal with external negative influences (Allison et al 1998, Australian and New Zealand Environment and Conservation Council (ANZECC) 1999, Wescott 2006). Sloan 2002 has reported that the marine areas that are "no–take" tend to be too small for adequate ecosystem protection.

Some researchers are of the opinion that large no-take areas near human populations maybe unachievable especially in the developing world (Sloan 2002). Governance of these areas in some countries is taking care of people as well as the environment within the borders of Marine Protected areas (Ho et al 2014). The implementation of MPAs as conservation areas around the world has taken time and resources (Fox et al 2013).

Recently there has been a tendency to look at larger areas of ocean for protection, labeled large scale marine protected areas (LSMA), as marine conservation areas larger than 100,000 square km (Jones 2011 in Leenhardt et al 2013). Well documented are the effects of threats outside of MPAs boundaries and the extent which water being a fluid medium is subject to these threats (Allison et al 1998, Sloan 2002). Nearly all interviewees questioned on MPAs referred to this factor of the marine environment subject to outside influence behind the boundaries of a MPA. For instance, treaties such as MARPOL look to reduce the oil pollution to the marine environment from ships (Haward and Vince 2009).

This chapter gives the chronological history of marine reserves in Victoria. Other writers give the systems and classifications of marine reserves; this chapter does not concentrate on that as this is well documented (Kenchington 2012, Roberts 2000, Scientific Peer Review Panel for the National Representative System of Marine Protected Areas 2006). This story concentrates on the 24 years of planning and campaigning for a marine reserve system and the declaration of a marine parks system for Victoria in 2002. It also gives an account of some of the early marine reserves and tracks events from 2002 to 2013 in Victoria.

4.2 History

4.2.1 Early parks

The story of marine protected areas revolves around some strong advocates and groups. This began in the 1970s with the Scuba Divers of Australia campaigning to fully protect a large area of the southern end of Port Phillip Bay from fishing. The Director of National Parks in the 1970s, Don Saunders, received this proposal, which then had other political pressures applied to it. In particular commercial and recreational fishing interests were active which resulted in only a small number of areas being considered for protected areas at this time. The Pope's Eye Marine Reserve, which is about 100 meters diameter around an artificial made island in the southern end of the bay, was the only area fully protected. There were a few other sites that had some level of protection applied, including a number around Point Nepean and Point Lonsdale that had various forms of protection. The sub tidal areas within those protected areas only extended a few meters off shore (Interviewee MP00789). The Harold Holt marine reserve was the first marine reserve to be declared in Victoria in 1978 as a tribute to the loss of the Australian Prime Minister from a swimming accident (Wescott 2006).

The South Gippsland MPAs, including the waters of Wilson's Promontory National Park, were the next parks declared after the 1982 election. The Land Conservation Council (LCC), well known as the public land use advisory organization in Victoria, had included the declaration of an MPA in its recommendations for the whole of the South Gippsland area. In late 1982, several MPAs in the South Gippsland area were proposed in the final recommendations. It had been five years since the proclaimed Harold Holt MPA in 1978 and the declaration of these areas in South Gippsland as MPAs became known as the Bunurong campaign. These parks appeared to surprise the local community and were controversial in their implementation (Wescott 2006). Wescott 2006 records that this could have worked against the long-term success of MPAs policy in Victoria.

"But anyway, that was the first push and the really...up until the Marine Investigation, when it was announced in the late 90s, the proposals had come really

for Marine Protected Areas, from community groups pushing them in their own local areas" (Interviewee MP00789). Joan Kirner was elected into the Victorian Parliament as an MLC (ALP) in 1982 and had a significant role as Minister for Conservation, Forests and Lands from 1885 to 1988 (Heywood 2002).

The Labor government was elected in 1982 with Joan Kirner initially appointed the Minister for Conservation, Forests and Lands, before she went on to be Victorian Premier (Heywood 2002). Interviewee MP00789 reported that these MPAs included Wilson's Promontory and Bunurong, and that Joan Kirner famously announced way back in the day, after the Bunurong Campaign in 1982, which was really led by the local community around Inverloch, that there would be no further Marine Parks established in Victoria (Interviewee MP00789).

4.2.2 Marine Investigation and the Land Conservation Council (LCC) process

After this halt in proceedings, the Victorian National Parks Association (VNPA) and the Victorian Conservation Council (VCC), using the argument that the Land Conservation Council (LCC) had only looked at areas of **land** for reservation and protection across the whole of Victoria, lobbied the Government to propose a Marine Investigation. This lobbying took ten years to achieve the government carrying out its own directive to the LCC to begin the investigation across the whole of the marine waters of Victoria (Wescott 2006). It is relevant to look even further at the characteristics of the LCC developed over time as the public land advisor to Victoria and the earlier history of public land in Victoria, to see the context in which this marine investigation was undertaken.

The Liberal Bolte-led government established the LCC in 1971 and as we have seen in Chapters 2 and 3, with great debates existing regarding public land and water in Victoria. One large debate, known as the Little Desert dispute, where the government attempted to promote more agricultural land in the area of the little Desert in northern Victoria, nearly bought down the Bolte government and the LCC was formed as a means of resolving this dispute. The LCC was still recommending on the basis of very sound scientific information 26 years after it was formed. It had divided

the state into seventeen regions and completed comprehensive reviews having built a substantial creditable reputation based on science. The LCC went on to be replaced by the Environment Conservation Council (ECC) in 1997 and evolved into the Victorian Environmental Assessment Council (VEAC) in 2002 (Clode 2006).

The actual beginning of public land in Victoria was in 1786 when the British annexed Australia as no man's land, "terra nullius." This meant that the entire of Australia was effectively declared public land (Clode 2006). Focused on the land component of preserving some of Victoria, Bolte made a promise to the electorate, that he would make 5% of Victoria, protected in national parks (Clode 2006).

By 1974, a set of twenty-three different pubic land categories was devised and in place. At one stage in 1988, the categories of public land had grown to 50, which were then rationalized down to 19 in 1994. The work of the LCC pushed the Soil Conservation Authority to undertake mapping of the entire of Victoria based on a classification system that workers had previously devised but not executed except over a small area. Other pushes for data connected with public submissions to the LCC led to the development of socio and economic studies undertaken to provide data to the LCC (Clode 2006). Extensive flora and fauna surveys were conducted that employed a team of staff based at the Arthur Rylah Institute, Wildlife Research in the Fisheries and Wildlife Division of the Department of Conservation, Forests and Lands (Interviewee MP00789). The scientific information was broader with a holistic approach, covering not just the most visible fauna species, but including invertebrates, reptiles, vertebrates and flora. The Victorian National Parks Association (VNPA) consistently made submissions to the LCC reports and draft recommendations (Clode 2006, 70).

The government instructed the LCC to commence the marine and estuaries study in 1991, just before it was defeated in an election, after ten years of lobbying by the Environment Council of Victoria (ECV) and VNPA for this study to begin (Wescott 2006). Wescott (2006) refers to ten years of lobbying for this first study to commence after achieving a commitment in the form of a component in a written political party platform. Interviewee CX58794 refers to the importance of achieving these policy platforms by environmental groups looking for conservation gains as

their implementation is often played out years later. At this stage there was no government commitment to anything more than an investigation. As detailed in Chapter 3, the LCC delivered on 6,400 recommendations to government over a 26-year period with a 90 percent acceptance rate, along with thirty investigation reports on the designation and recommendations for public land across the whole state of Victoria (Clode 2006). Before this time, as we see in the section above, marine reserves were about locals pushing for reserves in their own areas.

Interviewee MP00789 detailed the features of the LCC process that are also seen in (Saunders 1996) and Clode (2006) as including:

- Transparent process with a legislative process
- Clearly set out steps in the process, including investigation and draft recommendations
- Scientific background information that was indisputable, often from commissioned flora and fauna survey
- Legislative requirement for public submissions at each point of the process
- Publishing of the public submissions
- Time in the process for the public to build capacity on the subject areas.

The reputation of the LCC as having a strong and independent role with the characteristics above was a key to its success (Clode 2006). Clode 2006 makes the case that reputation is key for public authorities. Ten interviewees all agreed or mentioned the LCC process as a positive tool in conservation programs.

An important point is that NGOs in Victoria defined and pushed for the investigation to be aimed at a system of Marine National Parks after the investigation had begun and as part of the process. The announcement by the government of the marine investigation by the LCC did not include the establishment of a Marine National park system (Interviewee MP00789).

“But the process in Victoria didn't actually firstly identify...well it didn't say that there were going to be Marine National Parks. It said that there was going to be a system, potentially. There was a Marine Investigation by the Land Conservation Council, but there was never...well, in the early stages at least, when the Government of the time actually announced that investigation, it wasn't to establish a Marine National Park system. It was to undertake a Marine Investigation, which there may

be recommendations that may come out, including Marine Protected Areas, but the actual nomenclature, and the focus on Marine National Parks came as a result of process, and push really by the NGO movement, as the process went through its various iterations" Interviewee MP00789.

Another event, The Fourth Fenner Environment Conference 1991 on Marine Protected Areas in Canberra, also acted as a catalyst for action and collaboration on marine areas. As a national forum, it drew a lot of interested parties together as an independent forum that is funded independently to support up and coming areas of interest in natural resources (Wescott 2006).

4.2.3 The Pathway to the establishment of a Marine Protected areas system in Victoria

The Marine, Coasts and Estuarine investigation by the LCC covered the entire coastline of Victoria from the Victorian offshore territorial limit (three nautical miles) to a distance of approximately one kilometer inland from the high-water mark and released a draft final report in 1996. The study was conducted from September 1991 until August 2000, as there was plenty of work to do following the draft final report (Clode 2006). This report proposed 21 multiple-use MPAs, of which relatively small portions would be set aside as no-take zones (MPA News 2003). This proposal was not taken up, as debate continued with pressures especially from commercial and recreational fishing. In 2001, there were still only .05% of the Victorian Coastal Waters that were in highly protected MPAs, with approximately 4.5% of Victorian Coastal Waters in the total of MPAs (Wescott 2006).

A major finding by all concerned with the LCC process for Marine reserves was that all the same problems existed as experienced by the land parks and fought over for a period of 100 years in Victoria. The marine investigation covered the whole of the marine area of Victoria rather then being completed on an area by area basis like the LCC investigations of the land mass of Victoria (Clode 2006).

“Workers felt that they were starting at the beginning with marine areas, without the public knowing and understanding the areas and without fundamental legislation of protection” (Interviewee MP00789).

The system of public land categories that had been worked out for land did not apply to the marine areas and the LCC had to start at the beginning.

“It did indicate that there would be a system, potentially. This was quite different to the LCC investigations of public land where Public land categories, including National parks and wildlife reserves had been established by legislation many years previously. The actual nomenclature of marine national parks and marine protected areas in Victoria came out of the process and the pressure of NGOs, not out of a government commitment in the initial stages of this study”(Interviewee MP00789).

The NGOs had to maintain momentum in the campaign for MPAs over an extended period of time and not allow the agenda slip. The VNPA is listed by a number of researchers and interviewees as a champion in this campaign (Wescott 2006). People like Jeff Durham, VNPA and Geoff Wescott Conservation Council of Victoria (CCV) and Tim Allen, Marine and Coastal Community Network (MCCN) applied political pressure. In addition to using an evidence-based approach based on sound scientific survey and information, the LCC process allowed time for community momentum to build behind concepts and allowed public debate and discourse (Interviewee MP00789).

This LCC Marine Study was originally to take 4 years, but took 10 years, mostly because of the opposition of fishing, both commercial and recreational (Interviewee MP00789). There was also debate about the value of no-take parks compared to multi-use parks. This process had six periods of public comment and was managed by three successive state governments (MPA News 2003). In 1997, the government eliminated / disbanded the LCC and replaced it with the Environment Conservation Council (ECC), and a new board was devised. This board consisted of three people, from the fields of academia, agriculture, and finance. In 1998, this new organization, the EEC, put out an interim report for public comment that included the objectives for the selection of MPAs on a multiple-use basis (MPA News 2003). The

disbanding of the LCC and replacement with another organization meant a considerable delay in proceedings with the ECC producing its final recommendations in late 2000 (Wescott 2006). These recommendations represented a change in direction and proposed a system of no-take marine national parks and no-take marine sanctuaries, about 6.2% of Victoria's marine waters (13 National Parks and 11 Marine sanctuaries). It seems that the new Council had decided that greater protection would be afforded if there were no-fishing areas (MPA News 2003).

Significant lobbying occurred on a bill that the Labor government then put to state parliament, with modifications made to state boundaries and compensation to commercial fishermen. Support from the opposition was lacking, despite these compromises, and the government withdrew the bill in 2001 (MPA News 2003, Wescott 2006). Interviewee MP11568 indicated that the compensation to commercial fisherman was very important in finally getting agreement for a second version of the bill, introduced in 2002. It was not so much the amounts of money but the principle that they would be compensated that made a difference (Interviewee MP11568). The battle at this stage was the main Melbourne group of people that had 75% of the population versus 42 smaller regionally based opposition parties who were against the legislation (Wescott 2006, Interviewee MP11568). The continuation of the statewide approach by the ECC was something the organization felt was worthwhile since in their experience they got about as much opposition on each small individual marine park as they were receiving on the whole statewide proposal of marine parks (Interviewee MP11568). The second version of the bill, which succeeded in having 5.3% of state waters protected as marine national parks and sanctuaries, had some further modifications, especially to the most commercially valuable areas for fishing. Further gains in compensation were also made with the parks proclaimed in November 2002 (MPA News 2003).

The establishment of this Marine Protected areas system in Victoria followed 24 years after the first marine first park was declared and was dependent on policy commitments from a Labor government elected in 1982 (Wescott 2006). The Bracks labor government made a commitment to a Marine Parks system just prior to being elected in 1982, not thinking that they would be elected (Interviewee CX58794). The main groups supporting the concept of marine protected areas at these early stages

were the Australian Marine Sciences Association (AMSA) and the Victorian National Parks Association (VNPA) (Wescott 2006).

4.2.4 The Marine Environment Report 1995 and IMCRA bioregions 1999

The Marine Environment Report for Australia in 1995 included details of the current state of the marine environment and an Annexe report on MPAs (Zann 1995, Wescott 2006). Commonwealth funding was provided to the states to complete assessment of comprehensive, adequate and representative (CAR) areas for marine reserves, progressing their information base on which areas to establish marine reserves. Funding was provided under the Ocean 2000 program, a Commonwealth initiative, to establish bioregions that meant considerable amounts of money to each of the states to undertake desk studies for marine reserves.

The Commonwealth also implemented a plan, and assisted with funding to get this work done. Designed to assist in regional planning, IMCRA v 3.3 provided for marine regionalization of inshore waters, forming an Interim Marine and coastal Regionalisation of Australia (IMCRA) (Commonwealth of Australia 2006). The IMCRA Technical Group identified five distinct bioregions in Victoria (IMCRA Technical Group 1998, Wescott 2006)

This work was then updated in 2005 to the version IMCRA v4.0 to take areas of the marine environment and categorize them, simplifying relationships between the physical environment and species distribution and looking at patterns in species distribution at different spatial scales (Commonwealth of Australia 2006). The new work combined the early IMCRA v 3.3 with benthic studies of the National Marine Bioregionalisation (NMB) for off-shelf waters. In 2005 this combination was completed as the National Marine Bioregionalisation and launched by the Australian Government Minister for the Environment and Heritage, Senator the Hon Ian Campbell extending the regionalisation of Australia's marine jurisdiction from the continental shelf to the edge of the Economic Exclusive Zone (EEZ) (Commonwealth of Australia 2006).

The National marine Bioregionalisation project achieved an agreed set of benthic marine bioregions and pelagic regions. Prior to this the IMCRA only covered the shelf areas of the EEZ (Heap et al 2005). Therefore this work was an improvement of the data available for approximately 80% of the benthic marine habits and associated biota of Australia's EEZ (Heap et al 2005). This work gave five regions for the marine bioregions of Victoria (Commonwealth of Australia 2006).

4.2.5 Marine and Coastal Community Network 1993

The Marine and Coastal Community Network was a driver for the establishment of marine protected areas. There was some money left over in the Commonwealth's Ocean 2000 rescue program after the survey work by states. The NGO groups, particularly the Australian Marine Conservation Society (AMCS), argued that this money be spent raising the profiles of Australia's marine environment and the issues affecting the environment and Ros Kelly, the federal minister for the Environment at this time agreed. Funding for the Marine and Coastal Community Network project was managed by the Australian Marine Conservation Society (AMCS), and approved by federal Minister for the Environment Ros Kelly, despite the bureaucrats in her federal department not supporting the approval of a community engagement project (Interviewee MP00789).

The Marine and Coastal Community Network (MCCN) in Victoria was formed in 1993 with funding for a coordinator, made available from the Ocean Rescue 2000 program, under the commonwealth program; National Heritage Trust One (NHT1). The Oceans Policy for Australia at the commonwealth level was agreed in 1998 (Wescott 2006,Vince and Haward 2009). The Ocean Rescue 2000 program was a result of Hawke's statement that Australia would expand its system of Marine Protected Areas in 1990. Arguably, it is this statement that started work on Marine protected areas at the Commonwealth level (Interviewee MP00789). Ocean Rescue 2000 consisted of a number of elements; one was the expansion of Marine Protected Areas around the country. In fact other statements by other federal politicians followed this statement on Marine protected areas at the Commonwealth level. The Howard government made policy commitments, with Robert Hill as the federal

Minister of the Environment and Burke's announcement with the Commonwealth Marine Protected Areas in 2013. The government stopped funding to the MCCN in 2008 (Interviewee MP00789).

4.2.6 Communication plan

It is clear that a very strategic and tactical approach was used by NGOs, and groups supporting the development of Marine Protected Areas for Victoria over an extended period of time (Wescott 2006). The Environment Council of Victoria (ECV) bought in some overseas experts to assist them with a strategy. These experts suggested that to get the public on side, a system of marine protected areas named Marine National Parks maybe the better strategy. The VNPA commissioned social research and focus groups undertaken by Open Minds Pty Ltd, on the terminology. On the basis of focus research, it was found the term Marine Park was associated by the public with places where you kept dolphins and seals. This focus group information was fed back to the councilors of the ECV with the proposal that to achieve a system of marine reserves, they advocate for a system of Marine National Parks within a system of broader marine management (Interviewee MP00789).

"What actually came out very strongly in the social research was that people understood that National Parks, as on land, were places that were for wildlife, but where people could go and enjoy natural wildlife, and so the term Marine National Park was coined as a result of testing on focus groups." (Interviewee MP00789).

Realizing that in the case of marine parks, the conservation groups would have to firstly convince the public that there was something worth protecting, they looked to land examples for inspirations. Since very little protection for the marine environment had occurred up to that point, the groups considered that they were at the beginning of a phase compared with land conservation in Victoria, which began with the establishment of National Parks (Interviewee MP007890). Victoria increased its terrestrial National Parks 14 fold between 1970 and 1995, which made a very strong linkage in the minds of the public (Wescott 1995, 2006).

Secondly, the thought that protected areas had a place in the space of the marine environment was another thing that the public would have to accept if the groups were to succeed (Interviewee MP00789).

“The second thing was that, in fact, protected areas had a role in the space, and that was quite a challenge to many people, to actually accept that” (Interviewee MP00789).

This was clearly seen in the pressure that was applied by commercial and recreational fishing pressures combined with shipping interests against the proposals. Thinking of what gained support in land conservation, the groups looked to using names for parts of the marine environment that the public could relate to (Interviewee MP00789). The educational program devised by the MCCN to support the CAR MPA system was based around names the public related to within the land habitat, for example forest, garden and meadow. Raising the profile of the value of marine habitats by increasing people’s awareness of Kelp Forests, Sponge Gardens and Seagrass Meadows, a series of posters on marine habitats and fauna were produced and promoted. Iconic scenic sites on the coast were also used to show the beauty and uniqueness of southern temperate marine environment of Victoria and these series of posters were published in the Sunday papers (Wescott 2006).

Cultivating key media outlets and championing a regular weekly timeslot, Tim Allen and Chris Symthe gave consistent information about marine protected areas and generated press releases around marine issues. Starting a radio program called “Radio Marina” on station 3Triple R, work was done to provide raw underwater footage to TV channels and other outlets based on focus group information about what pictures engaged the public. It was found from the research that the public liked to see people diving with lots of fish and high quality photography of these subjects was obtained from the diving organizations. These products, including slides, images and video resources were developed in conjunction with other organizations like the Museum of Victoria (MV), the VPNA and others (Interviewee MP00789).

Drawing in scientists and giving them a place and credibility to express their views, the MCCN through Tim Allen, contacted the Australian Marine Sciences

Association (AMSA) and other members of the marine science community. The AMSA started to have very strong links with these scientists to bring them into the debate around marine policy, including the issues of Marine Protected Areas, Marine National Parks, introduced pests and water quality. These individuals were also fed into the NGOs with the MCCN working very closely with the VNPA. The VNPA's reach was to include the marine science community, the dive industry and the recreational tours sector due to Tim Allen attending meetings of the various groups and encouraging linkages. The network was then broadened across the state to potential groups or individuals supporting marine conservation in each coastal town with linkages to the scientists above (Interviewee MP00789).

"Well it was starting to market effectively the marine environment and the need for marine conservation."(Interviewee MP00789).

The idea that the tourism and dive industries depended on clean environments was a major selling point to these industries that encouraged them to assist in the campaign. A skilling campaign to give confidence to these industries and groups on how they could influence the campaign was devised, including skills on writing letters of politicians and media, including how they might argue to assist in the support of marine parks. Prior to the internet and websites in the 1980s, this educational work was done with slides and presentations (Interviewee MP00789).

Later in the Marine National Park Campaign, a scanning campaign where the VNPA put postcards into letter boxes right across the Victorian Coast was used, following the pulling of the legislation and leading up to the second stage. The postcards showed the beauty of Victoria's marine environment and had a tear off slip at the bottom to return to the VNPA so that they could re-direct these to politicians in bottles to put on the steps of parliament. Approximately 8000 of these postcards were filled out by the public which later allowed email addresses to be collected and the VNPA to break these email addresses by electorate and target these individuals to focus on their local politician with key messages around Marine National Park Proposals in their local area (Interviewee MP00789). This resulted in 5000 emails sent to John Brumby in one weekend at a time when politicians did not filter their

emails, when he proposed only three large Marine National Parks later in the campaign, instead of the system right across the state (Interviewee MP00789).

Another form of support used by the MCCN was to get a 100 plus PhD scientists to sign a consensus statement supporting marine national parks through Professor Peter Fairweather at Deakin University, saying that there was very solid scientific evidence on which to base the comprehensive, adequate and representative (CAR) system (Interviewee MP00789).

4.2.7 MPA system realized – 2002

The years between 1982 and 2002 would be a battle. The real debate on MPAs began in 1982 with all the groups for conservation maintaining that there had to be a system of "no – take" reserves to be based on the CAR system (Wescott 2006).

"With three changes of government in the time of development of the MPAs system, it is interesting that the individual who had the Premier's position also made a difference"(Interviewee CX58794).

"In Victoria is the change of Premier. Same party, change of Premier made a difference here. Steve Bracks, with John Thwaites as his Conservation Minister, were very... from opposition into government were very pro. John Brumby is probably the least environmentally conscious premier we've had in Victoria since Sir Henry Bolte, as an individual. He's never the... never been interested at all. And then he becomes premier here and all of a sudden everything goes cold as a dead fish." (Interviewee CX58794).

4.2.8 The next 10 years of management after the 2002 decision-Paradigm shift, Natural asset goals 2012

"So I think the... although the objectives from the people who were in support never really waned, it was always about biodiversity conservation, nature conservation, the sort of agencies and the framework that was considering the issue altered in a bigger frame. I think then, once they're there and then you move on to the Parks Victoria sort of policy statement, their strategic plan on parks, which was a 10-year vision

from 2002, and then we had the Auditor General's report, and now we've got the Victorian Environment Assessment Council of Marine Investigation. So the waters... pardon the pun, the waters have got muddy again, and much murkier." (Interviewee CX58794).

"But all the way up to the ECC recommendations, it was strongly biodiversity conservation. The package that was put together to get it through the upper house, because it was a minority government putting it through in 2002, had to keep on dragging in recreational and economic and social much stronger than when it started. We celebrated this 10th anniversary last 16th of November." (Interviewee CX58794).

"I think it would be worth saying that the Auditor General's report has been misused, misquoted and abused politically since it was released. It was a critique of... and as always a desk study critique of the administrative processes internally in the agencies concerned. It was equally critical of DPI, primary industry of DSE, it was completely distorted in the media, particularly the Weekly Times, Geelong NewsCorp grouping. I wrote to the Auditor General at the time as an academic, and I said I... my reading of the legislation is that unfortunately you can't say anything about your reports being distorted in the public arena because you're an officer of the parliament." (Interviewee CX58794).

"And he confirmed that. He said, look, once we release it we can't defend it, it's up to... it's a parliamentary document, we are not involved in politics or... parliamentary or public discourse and debate. We are reliant on others to correct what has been..." (Interviewee CX58794).

"He basically was admitting that it had been distorted, but... so that was... it's actually a very good report, and it is really quite salient and pertinent. But the way it was misused was just disgraceful." (Interviewee CX58794).

"Parks Victoria... and I was on the board at the start of all of this, I was actually on the Parks Victoria board, and so we wrote that very... what I thought was a very good strategic planning document, but PVE and that first package of marine parks,

because they'd only have a five year... might have even been a three year time scale, so money was given to Parks Victoria and DVI in the package, a $100 million package, but it ran out. And there was never anything available from government to those agencies to keep it going. Very familiar story that way. So in a way, the Auditor General was in part commenting on the fact that it was a short term programme that was meant to be monitoring a long term process." (Interviewee CX58794).

To put this into perspective, if we look to land examples, we find that the report by the LCC Statewide Assessment of Public Land Use, undertaken between July 1986 and September 1988, refers to the numerous accepted LCC recommendations that the relevant government departments had not implemented yet. Some of the defence by the Department of Conservation and Environment of the time was the complexities of the Crown and (Reserves) Act (Clode 2006, 108).
This raises questions of recommendations by government and the ability to fund recommendations and government commitments.

4.2.9 Victoria's Marine Habitat mapping project

The undertaking of Deakin University to map major ecosystems in the marine environment in Victoria has been developed over a 15-year period. Initially assisted with Commonwealth funding, this project has since proceeded with the University's own funding.

4.2.10 Victoria's Marine Parks in High Protection Categories

An environmental goal of the reservation of an amount of habitat area was foreshadowed in Chapter one. Table 4.1, seen below, shows the amount of marine areas in reserves in Australia. Clearly an ecological component in a high protection category has been achieved in this work on marine protected areas in Victoria over a period of conservatively 24 years. One advantage of environmental governance is that there is an expectation of aiming for clear environmental results linked to environmental goals. Table 4.1 shows that the goal established by NGOs of a marine

parks reserve systems was achieved with a 5.24 percentage of waters in high protection category.

Table 4.1 Area (square kilometres) of Australia's marine parks and reserves in protection categories (IUCN categories I and II) reproduced from State of the Environment Report 2011 (Table 6.1), 440

	C'wlth	NSW	NT	Qld	SA	Tas	Vic	WA	Aust
IUCN 1	240 039	665	0	412	771	737	**0**	2974	
IUCN 11	117 558	0	- a	16 197	865	477	**535**	-	
Sum of IUCN 1 and 11	357 597	665	0	16 609	1 636	1 215	**535**	2 974	381 230
Total waters	8 528 214	8 802	71 839	121 994	60 032	22 357	**10 213**	115 740	8 939 191
% in IUCN 1 and 11	4.19	7.56	0.00	13.61	2.72	5.43	**5.24**	2.57	4.26

Australia = total for all jurisdictions; C'wlth = Commonwealth (managed by the Australian Government); IUCN = International Union for Conservation of Nature; NSW = New South Wales; NT = Northern Territory; Qld = Queensland; SA = South Australia; Tas = Tasmania; Vic = Victoria; WA = Western Australia

a IUCN II data from Western Australia and the Northern Territory have been removed, because in these jurisdictions fishing is permitted, which is inconsistent with IUCN II zoning.

Source: (2008 Collaborative Australian Protected Area Database data (excludes the extended continental shelf and the Australian Antarctic Territory) in State of the Environment Committee 2011, 440)

"As of 2008, Australia had declared 4.3% of its waters as highly protected (IUCN categories I and II) MPAs, including MPAs in Australian waters and state and territory waters (Table 4.1)" (State of the Environment Committee 2011, 448).
As of 2002, the state of Victoria, Australia, increased its "no-take" marine protected parks (IUCN category 11) 10 fold to 5.24 % of its coastal waters. This amount of

reserves in one action, compared to figures worldwide is reported by Wescott (2006) as startling (Wescott 2006, 906). It is also a considerable amount of highly protected "no-take" reservation (IUCN category 11) compared with the other states in Australia. The only other state with a considerable amount of highly protected reservation is Queensland which hosts the Great Barrier Reef reserve with Commonwealth government intervention, including the use of the EPBC Act and the *Great Barrier Reef Marine Park Act 1975* legislation at Commonwealth scale and the Great Barrier Reef Marine Park Authority (Wescott 2006, 907, State of the Environment Committee 2011, 442).

Chapter Five

Case Study Analysis

> *"The challenging question for further research is to what extent and under which conditions different and often co-existing modes of environmental governance enable successful societal change. In other words, we need more empirical studies that focus on:*
> *(a) the analysis of variations in modes of environmental governance over time (preferably sector specific)*
> *(b) the analysis of drivers of and barriers to shifts in environmental governance*
> *(c) the analysis of the causal relations between modes of environmental governance and (un)successful societal change towards sustainable outcomes*
> *(d) the analysis of interrelations between the accumulated modes: can and do they reinforce each other or are they discordant?"* (Driessen et al 2012, 442)

5.1.1 Introduction

Clearly there is capacity to learn from different modes of environmental governance and different drivers of and barriers to shifts in environmental governance in case studies to inform other areas. This thesis concentrates on two areas:

- The definition of a framework that can be used for analysis of environmental governance
- The application of learning from case studies of environmental governance, to the environmental governance dilemma of Australia's coasts.

This chapter applies the theoretical framework presented in Chapter One to the three case studies. Each of the five analytic criteria in this framework is used to assess the case study data over an extensive period; in most cases at least forty years. The assessment of the case studies provides an opportunity to evaluate the framework's robustness and apply these findings to broader questions affecting coastal management in Victoria. Clearly there is capacity to learn from environmental governance in case studies to inform other areas. It is expected that this experience of environmental governance in Victoria over extended periods of time with many actors applying thought and resources to these problems will present useful conclusions. This is all encompassing of the things that may contribute to success of environmental improvement as the definition of environmental governance for this thesis, defined in Chapter One as " all kinds of measure deliberately taken to prevent, reduce and/or mitigate harmful effects on the environment" (Driessen et al 2012, 2).

5.2 Analysis of the case studies

5.2.1 Environmental Objectives

Interview data suggests that environmental objectives are a key plank to achieving conservation goals. Objectives ranged from an agreement across a wide range of stated outcomes to program objectives. Interviewees regularly referred to the importance of resourcing in dollar amounts related to having objectives, and questions on the clarity of environmental objectives in the case studies elicited even more response and depth.

Case Study 1 – Environmental Flows

Heavily influenced by the Public Bodies Review in the 1980s, the Victorian government had an objective that related to the establishment of institutional arrangements for environmental flows. The strategic nature of the objectives of the Public Bodies Review supports the hypothesis that explicit objectives are required for success in an environmental government program or environmental management. The actual environmental objectives for the resource, as an amount of water for a river reach, took decades to define. Focusing on catchment management and river health, this work by the Victorian government set the scene for high-level principles that were important in achieving success of the environmental flows programs through to 2013.

Interviewee XS1110-2 reported that a major factor in the achievement of environmental flow goals was the continued reference by all government personnel working in the area to the catch cry healthy rivers, which is a principle at a high enough level that all people would agree with. The agreement obtained at an irrigation industry level continued to be propagated as something of benefit to all and is reported by interviewees as an important factor in success. Another important aspect was the earlier work on catchment management, including institutional arrangements, which assisted in the recognition that there was no framework that allowed environmental flows to be identified or implemented. Interviewee XS1110-2 reported as critical the integration of the environmental flows into a wider

framework, where overall stream health was the issue with catchment health and low environmental flows being recognized as the key factors that required to be addressed, but another interviewee noted "nonetheless I think that even then the sort of objectives of the programme were pretty – what's the word? – vague, and are more responding to, I think, the demands of Commonwealth of Australian Governments (CoAG) or some other driver rather than necessarily the environmental objectives that we might have needed. So it was saying we've got to do something, whatever, initially" (Interviewee WT445890).

Meeting of early objectives at specific sites were not achieved despite significant scientific research to determine habitat requirements for fish and invertebrates (Gippel et al 1994). Reasons for this vary with evidence of the extremely high value placed on Melbourne's water supply and irrigation supplies playing an important role. Interviewee WTXS1110-2 points to the long development time it took to get environmental flows in a broader area of public acceptance, define how much water would be required and a discipline around this requirement, assess how much water is being used, and establish appropriate institutional arrangements. They commented: "So I think back at that point there were some quite clear objectives around whole of catchment river management, quite clear. Not so much ecological but a) we had a problem with rivers and their condition and b) in some cases it was due to lack of flow and in some cases a whole range of catchment influences. So what they did then was to go off and say there's no framework for any of this and construct the institutional frameworks. The whole of catchment framework was constructed earlier. The flow one took a lot longer to get credibility because there a range of things it had to do was a) establish what needed to happen, a whole discipline about how much flow does a river need; then if you like a whole discipline around the water allocation. Rights consumptive at least. It's very clear that in this whole area of water there is not a good runs independently of the broader framework and if you try that it doesn't work. It's a very clear lesson for me, I think, is something in this area. It's got to be integrated in a broader management framework." (Interviewee WTXS1110-2)

Thirty years later following establishment of a comprehensive holistic program, goals relating to recovery of environmental water were achieved, including buy back

of water from irrigation. The cost of irrigation water was considerably less than the cost of water supply to Melbourne to supply urban water. The importance of water for human consumption and the related political cost of non-delivery of drinking water to urban Melbourne was a driver to the buy-back from irrigation. A key element here was the Public Bodies Review Commission report that drew more political and community attention to objectives and linked it to river management, catchment management and the supply and cost of water supplies to irrigation and urban purposes. Importantly the evolution into a CoAG agreement between states and the commonwealth government's requirement for states to report on the progress they were making on "Stressed Rivers" was very important in getting the states to perform and make objectives about environmental flows for rivers. This reporting was also tied to receiving state funding from the Commonwealth, which focused attention of government areas that do not normally have any accountability for the environment. The objectives relating to the establishment of a new institutional framework have been met with environmental entitlements and purchased water allocations (Natural Resource Management Ministerial Council 2006).

Case Study 2 – Wetlands

The importance of clear environmental objectives was taken a step further in the Wetlands Conservation Program for Victoria in the form of defined actions to be carried out. This attracted a defined budget amount with a set dollar amount for each of the 28 actions and the allocation of accountability for implementation for each action across three government departments. Agreement from these government departments on the actions that they would undertake and a separate allocation of funding via Ministerial Council were present. It appears that the ability and initiative to clearly monitor this budget was a factor in the success of the program, ensuring that the stated actions were actually carried out. The conservation status and objectives for areas of public land that are also wetlands are detailed in objectives for public land categories of which there are more than 20 different categories in Victoria (Wescott 1995, Saunders 1996).

Arguably areas with the highest environmental objectives at the state government level are detailed in the National Parks Act. Wetlands reserved as National Parks

include the Barmah National Park declared in 2010 (Victorian Environmental Assessment Council 2007). Considerable areas of wetlands were given an international standing in legislation under the Ramsar Agreement in 1970s, including Corner Inlet (Kellogg Brown & Root 2010). Despite clear objectives for planning controls on private land and all the necessary background and technical work, including stakeholder agreement, the lack of advocacy and support meant this did not result in success. Changes in Ministers and the head of the department also changed the high level support for implementation (Interviewee WS119654). High level policy and a bipartisan commitment to conservation was stressed by interviewee WS119654 as important to the development of the conservation measures on the Wetlands Conservation Program, this included the Victorian State Conservation Strategy set within the context of the 1982 World Conservation Policy (Interviewee WS119654) (Victorian Environmental Assessment Council 2006).

Case Study 3 –Marine Protected Areas.

Clear environmental objectives related to protected habitat were originally undefined in the work on marine protected areas. The objective, to establish a Marine Parks System, was set by NGOs at a later date, having undertaken market research on what the public would relate to in the area of conservation for the marine environment (see Chapter Four). Supporters of Marine Protected Areas, particularly those outside government were always clear that the goals were biodiversity conservation and nature conservation. This was not necessarily the objective of government or politicians.

One interviewee commented: “So I think the... although the objectives from the people who were in support never really waned, it was always about biodiversity conservation, nature conservation, the sort of agencies and the framework that was considering the issue altered in a bigger frame. I think then, once they're there and then you move on to the Parks Victoria sort of policy statement, their strategic plan on parks, which was a 10-year vision from 2002, and then we had the Auditor General's report, and now we've got the Victorian Environment Assessment Council of Marine Investigation. So the waters... pardon the pun, the waters have got muddy again, and much murkier” (Interviewee CX58794).

It was highly noticeable that the government was not committed to an objective of a Marine Parks System when it began an investigation into marine areas by the LCC in 1985 (Land Conservation Council 1993, Clode 2006). The establishment of a MPA system was clearly a success, which took upwards of 30 years to get a statewide system of 5% of the marine area of Victoria as parks. As an interviewee noted "I think ... it was a good outcome, not a fantastic outcome but a good outcome, for 5% no take in 2002. But that is 11 years ago. You could argue that it was a... it was all we were going to get because that was pretty extraordinary. And it was pretty extraordinary to get it across the whole state in one go, given that there hadn't been a marine protected area declared in the previous what would have been 12, 13 years. So I think those of us who were deeply involved and had done it long term thought, well, this is fantastic, let's celebrate this. On the other hand, there are some pretty obvious gaps in what was there, and the Victorian National Parks Association has identified some of those gaps in the last couple of years"(Interviewee CX58794).

Overall

All interviewees agreed that setting of objectives were important in achieving results for the environment. The government's ability to set environmental objectives may be limited because of a lack of:

- Institutional arrangements
- Science translated into targets or
- Broad agreement at society level on higher-level environmental principles.

The research shows that these things have taken decades to achieve in these case studies. It may be possible using this analysis of environmental governance to use historical examples as models to get these background requirements in place for other ecosystems. This gives plenty of scope for frameworks for the future coastal planning. The future impacts of energy and water usage by a growing population of Victoria will also give plenty of reason to consider changes to planning and strategic approaches that consider objectives. Unless these explicit environmental objectives are put into strategic planning that covers land use and the built environment, government officers acting for the environment will be reduced to making superficial comments on options that are already well developed.

5.2.2 Spatial links- Ecological techniques

Case Study 1- Environmental Flows

A statutory volume of water allocated for the environment in 2010 has been achieved by this work, some of which commenced 30 years ago (Interviewee WT55671). An environmental entitlement in GLs of water is stored in a reservoir to be used as the environment's share, held by the Minister and paid for in the water price. These entitlements are now managed by the statuary authorities, which commenced in 2013. The scientific evidence for the amounts of water have been based on methodologies used over 30 years … "and at the same time paralleling with a whole lot of methodologies"(Interviewee XS1110-2). These ecological techniques commenced development in the early 1980s using indicator species and percentage of the flow methods.

The spatial component for the environment has not been fully addressed by an allocation of an amount of water. The carrier component of rivers and streams, the bed and banks, are not included in this allocation. The water legislation in Victoria, gives clear ownership of nearly all rivers and streams in Victoria to the crown to the five-meter line from the stream. Only in land alienated before 1880s are the bed and banks of streams in private ownership (Cabena 1983 in Fletcher 1998).

In cases where the bed and bank of streams are owned by the crown, the issue of percentage to the environment, is vexed by other uses; primarily stock watering directly in the stream, and destruction of native vegetation. The implicit environmental target for bed and banks is attached to the Victorian Index of stream condition and the natural resources inventory. Although not appearing as a spatial component identified legally, there is a target. Targets, relating to the index of stream condition are in several policy and program documents, including strategic plans, for example the strategy for Port Phillip and Westernport Catchment Management Authority (Port Phillip and Westernport Catchment Management Authority 2009).

Arguments relating to freshwater reserves indicate that there is not political will to allocate this spatial component of a river to the environment at the moment in

Victoria. Arguments relating to why freshwater reserves areas are not practical include the required management over the catchment and water quality that would be required to protect the river and streams to this level. It can be argued that the necessary levers to guarantee controls over catchments in order to have freshwater reserves are currently not available (Interviewee XS1110-2).

We have seen that scientists have presented very significant material on watering requirements and ecology over the thirty years. The ecology of floodplain systems, the intertwined nature of the water and its impact on species and nutrient pathways have been documented in numerous papers, articles and books (Humphries et al 1999, Stewardson and Gippel 2003). Following the application of the standard methodology for estimating environmental flows, approximately 20% of what has been recommended by scientists has been translated and implemented as a bulk amount of water (Interviewee WT4458900). These methodologies are highly evolved from the early scientific work and agreed state-wide and as well as having the principles agreed at the national level in Australia.

The history of environmental flows research in Victoria commenced with methodologies imported from the United States, where broad percentages of flow were considered with associated habitat implications applied. A general percentage considered was to retain at least 10 % of flow (Stalnaker and Arnette 1976, Stalnaker 1982, Tharme 2003). The widely used Tennant (Montana) method became the "most commonly applied hydrological methodology worldwide" after routine use in at least 16 states in North America. This method, developed in 1976, linked different percentages of annual flow to different categories of river condition and recommendations. It would appear that the increase in use in the last thirty years has scientists now considering smaller percentages and methodologies that demand active management of reaches of river to re-enact some natural conditions. One informant commented on the use of the identification of environmental flow techniques of Stalnaker and Tennant "that's all sort of gone by the by pretty much" (Interviewee WT9974).

Agreement on a statewide methodology has taken many years. Agreed National principles for the protection of healthy ecosystems were developed over four years.

This would indicate that although scientists have a range of techniques that scientifically are valid in defined habitat, bureaucratic process desires to have state-wide procedures that take considerable time to develop. The benefits of these state-wide procedures are an increase in acceptability and perceived equity. In the time taken to develop these, further use and pressures on the resource are likely.

The key point is that increasing justification is required from science to get amounts of the resource preserved and there is evidence from interviewees that community groups are unlikely to have control over spatial components of the environment due to the high value put on these resources by users (see Chapter Two). Compensation has also been used (Interviewee WT559210).

Priority has been given, especially during the period of the Brack's labor government to triple bottom line projects like the Wimmeria-Mallee pipeline, which achieved water savings from decreasing evaporation for both the environment and irrigation. "In a way it sort of... the way these systems are operated we've been forced into a position where you do have to defend each of those components. Because at the end of the day they can't deliver the whole package. That's what we've found. In every system we've looked at, I can say quite definitively, that I've been involved with, we cannot supply what's required, because in most of the systems we've gone beyond that in terms of extractions" (Interviewee WT445890).

"And I think one of the things I've just written here is that there's a great pressure on justifications for environmental water and a need for appropriate supporting science, so the science is way under more scrutiny because there is…" (Interviewee WT9974).

"Three billion bucks or whatever is being spent on water for the Basin plan and so there needs to be some more credible science behind it and science that we can learn off. I think the expert panels have been useful in terms of the big picture, what you need, and I've been on several, the Ovens and the Murray and things like that but actually implementing the flows, I think, is the next step where it needs to be a next level of detail down. I think there are two different scales there if you like" (Interviewee WT9974).

“No, it’s better use of the water that you actually have. So it’s a bit more event-based rather than just… So it’s looking more at key components” Interviewee WT9974.

“Well, they fit into the… I know everyone talks about adaptive management and the cycle and stuff like that. They’re much more attuned to that and using… coming back to the objectives that you set. So I think that’s the key way that flows…”(Interviewee WT9974).

“But I guess the magnitude of many environmental allocations are pretty small compared to what are needed and so sometimes it’s very difficult to measure the outcomes or the benefits” (Interviewee WT9974).

The implication of small amounts of water is that active management at sites is what will be required. Without larger amounts of water, processes down the river would be affected. Extremely large flood events will not be affected, however medium flood events will be highly modified (Shaw and Evans 1986).

“I think one of the key problems is that there is still not a total recognition of landscape scale management and benefits. So people have talked about managing a particular river reach or a particular site, so the whole Basin plan is based on icon sites and there’s not a great deal of recognition given to the connection between the sites” (Interviewee WT9974).

“Active management of environmental entitlements is going to keep on costing more money and we believe we need quite a lot of works to actually to use that water as effectively as possible. So to my mind, there’s this concept of it’s going to be active management and active management costs money but we do have environmental contribution of water price” (Interviewee XS1110-2).

Case Study 2 – Wetlands

Wetlands have had spatial definition in Victoria by mapping their limits. This has been the way of monitoring what is occurring on the ground, with the definition of wetlands in Victoria clarified by work for planning controls to protect wetlands on private land in the early 1980s (Interviewee WS1110 -1). A further achievement of the Wetlands Conservation Program was the digitization of the wetland data into GIS format. This means of making spatial links to wetlands on the ground was the focus of the Wetlands Conservation Program in its third year. Reference was made by Interviewee WS1110 -1 to the monitoring of on ground actions by the Wetlands Program, and the establishment of regional officers who assisted this under the Victorian Wetlands Conservation Program, designated as the establishment of regional officers. This was undertaken with the seemingly dedication of officers, referred to in interview with Interviewee WS119654 also referring to the importance of good staff.

"Wetlands in Victoria had great databases"(Interviewee WS1110 -1). It does not appear that the information was the problem in further implementation of high value wetlands policy or the proposed planning controls to protect wetlands. There was strength in the expert nature of the staff available to assist and the information available to back up the story on this ecosystem. "People listened because of the expertise and the reputation of the scientists involved and the quality of the science." "Absolute expert skills was the strength in the implementation of the program. People listened when you have the absolute expert skills" Interviewee WS1110 -1.

Regarding the achievement of works on the ground for wetlands, interviewees referred to the benefit of regional officers who developed close relationships with landholders to achieve more on private land than a centrally held grants program. This indicates that success was obtained achieving results on the ground and a spatial component for the environment by engaging landholders with a flexible program that also met their needs on private land (Interviewee WS1110 -1). This aspect is borne out in the recent commonwealth program of Bush Tenure, targeting wetlands in a similar way (Interviewee MP00789).

The translation of the scientific data to amounts for the environment did not last past the four years of the Wetlands Conservation Program for the high value wetlands, defined by Scientific Committee, used as an early expert panel technique. These wetlands are documented in the Directory of High Conservation Value wetlands that became a Commonwealth project, and piggybacked on the work in Victoria, including a minimum data set and key criteria to evaluate high conservation value (Victoria Department of Conservation et al 1986). Statewide agreement was obtained to a minimum data set for assessment of wetlands that clearly included additional key ecological components to water bird data that were relied on as the primary data source prior to the 1980s. The high value wetland data was comprehensive and provided to agencies to use in their resource allocation and planning decisions (Victoria Department of Conservation et al 1986).

Wetland areas under conservation protection designated in legislation are public land and the areas under the Ramsar agreement. Provisions provided under the Wetlands Conservation Program for Victoria for high value wetlands fell away with the emergence of the Kennett government, indicating that policy provisions do not always last more than one term of government.

Proposed planning controls for wetlands on private land in Victoria only referred to the land component of wetlands. These controls that were not implemented largely as a result of lack of broad and widespread public acceptance and advocacy, with the Minister and the head of the Department not willing to go ahead with an overnight implementation, despite stakeholder agreement with major stakeholders (Interviewee WS119654).

The allocation of ten wetlands to standing under the Ramsar international agreement and establishment of wildlife reserves in Victoria occurred without a great deal of science. The Victorian Field and Game Association (VFGA) was an active advocate for these actions, in particular the wildlife reserves, in association with the Field and Game Department in the 1970s.

More recently in 2013, wetlands are reported as having the problem of the lack of a revenue base. The largest impact reported is agriculture with wetlands in catchments

currently under the management of Natural Resource Management bodies (NRMs). Compensation to agricultural producers has been advised as key to the preservation of wetlands in the future. Networks for the NRMs and raising the capacity and scientific capabilities are listed as important to scientific data. Mapping has been found to continue be one of the most effective spatial links for management for the NRMs (Interviewee WS1126765).

Case Study 3 –Marine Protected Areas.

The spatial area data for Marine Protected Areas (MPAs) was scientifically based, and initially funded by the commonwealth for approximately $1million dollars of work. This work has been continued by Deakin University without any further assistance from the Commonwealth. Further, the quality of this survey information is becoming increasingly sophisticated at a rapid rate with the use of technology and scanners (Interviewee CX58794).

"Well the... most of it in Victoria is a marine habitat mapping project which started as a marine habitat mapping project of the parks when they were established. It's essentially done largely out of Deakin University, Warnambool campus" (Interviewee CX58794).

This information is reported as high quality spatial mapping covering approximately 28% of the marine habitat in Victoria's open coastal waters (Interviewee CX58794). Bioregional areas and representativeness were the basis for decision-making on which spatial areas were included in Marine Protected Areas (MPAs) (Interviewee MP11568). The community understood these principles in terms of there being only a small amount of one species or ecological community in a broad area, and therefore the importance of inclusion (Interviewee MP11568). The use of a Land Conservation Council type process was important because of the structured public consultation and reputation of being based on credible science (Clode 2006).

The information was based on representativeness, considerable scientific data and the CAR system that was in part funded by the Commonwealth and involved Australia-wide bioregions (Interviewee MP11568). Further to this, interviewee CX58794 refers to the public and adversaries wanting to use endangered species as a

criterion as to whether development can go ahead or not. As well pointed, ecology left this argument as the critical choice many years ago and moved to a combination of threatened species, species and processes and systems (Interviewee CX58794).

In spite of the high quality scientific data, the MPAs took over 20 years to implement, with the fundamental reason for this due to high and well organized opposition from the fishing industry and others (Interviewee MP11568). In the end, there was political involvement to decide on final boundaries giving the fishing industry ground on lobbied areas with compensation being very important (Interviewee MP11568). This comment was reinforced in other interviews: "Boundaries strongly influenced by political" (Interviewee MP11568) and "We know the boundaries were deliberately drawn to minimize the political fallout from recreational and commercial fishers" (Interviewee CX58794).

"But all the way up to the ECC recommendations, it was strongly biodiversity conservation. The package that was put together to get it through the upper house, because it was a minority government putting it through in 2002, had to keep on dragging in recreational and economic and social much stronger than when it started" (Interviewee CX58794).

"I think it started as a clear representative park system, biodiversity conservation primary objective process, took ages to get to its first step, then it really took off with the Land Conservation Council involved, Environment Conservation Council. And as it did that, the objectives of conserving fishing stock, recreational use, they sort of came in under that major biodiversity conservation objective. And in a way the objectives changed also with the fact that the Land Conservation Council went over to being the Environment Conservation Council, so there were changes in the legislation which brought in more economic and social considerations to what was a long-term Victorian process of analyzing public land, and in that case public land includes public sea" (Interviewee CX58794).

"The thing that probably got most people more upset was the use of... the way that some of these boundaries were drawn to leave out sub-tidal reefs, rocky reefs, where there were abalone. And it would be hard to find any decent abalone reef that was

put into the system, for example. Now abalones and scallops are the big... and crayfish are the big three in Victoria in terms of money. And so the industry claimed it didn't really have any information to give to the EEC about where the abalones were, and it was commercial and confidence. But strangely enough, all the boundaries that came out do things like go in a straight line, then do a very crooked bend, and if you go down you find there's a reef there that the abalone fishers were using" (Interviewee CX58794).

Ultimately, compensation to fishers for areas that they may have been perceived to have lost played an important part in getting the Bill for marine protected areas through parliament. Interviewee MP11568 referred to the importance of the principle of getting some compensation rather than the amount of compensation.

The relationship between advocacy and the spatial component is of particular interest in this case study because of the targeted use of information that the public could understand. This aspect was reported in interviews independently in both government and NGOs processes. This will be discussed further in the section on advocacy. Interviewees have commented that the information that has made a difference in this case study has been is what the public understands. "Align with their knowledge of something" and "The most successful scientific techniques in the translation to marine park amounts are the ones that the community get" (Interviewee MP11568).

The difficulty of spatial component for marine areas was mentioned by a number of interviewees. This acknowledgement that the marine environment is water and therefore inputs and outputs are perhaps even more apparent than a terrestrial environment. It was also noted that a line might not be so easily defined for the purposes of management. "There is no fence for a community group to defend those boundaries it would be difficult to do unless they actually documenting and recording it. Every boat must have a bloody GPS in it. Or then you would have community vigilantes you know, fishing in an national Park it is quite difficult" (Interviewee MP11278).

Overall

High quality science was referred to a lot by interviewees as critical to success in conservation and environmental management. Science was seen as independent and a credible source that arguments could come back to. The Land Conservation Council (LCC) process and science were referred to again and again as respected, solid and scientific. The fact that the LCC had science behind it is recorded as a major contributor of success (Clode 2006).

Despite the biologists reassurances that a variety of scientific methods are all equally valid in determining the habitat requirements needed for conservation, considerable amounts of time have been spent in determining consistent methods and in the case of environmental flows and healthy rivers, developing principles so that all the environmental practitioners knew what they are talking about.

Success is linked using the parts of the habitat and interpretation of science to obtain public perception and understanding. Campaigns were successful in gaining the support of the public if images were linked to what they could understand. This involves an interpretation of the data and information. The visual aspect was important in this.

Adequate methodologies appear to exist with translation of science and an amount of habitat into a spatial amount. Clearly the science has come a long way with state-wide and nationally accepted methodologies in some cases. This work started with endangered species and moved through ecosystems to processes.

Generally interviewees in all three case studies agreed that there was definition of a spatial component that could be defended by advocacy. However in the case of environmental flows it was pointed out that the allocation of an amount of water for the environment was not so much a spatial component as a “lump of water”. This insight followed to the conclusion that governments are unlikely to give community groups oversight of spatial amounts to the environment because of what the resource is worth to users who are looking for economic returns.

Compensation played an important role in two of the case studies. In the third case, the issue of compensation to the major user, agricultural producers, was raised by interviewee WS1126765 as a major future issue to the conservation of wetlands. The most important conclusion from this research in regard to spatial links is the amount of science now demanded for a small gain in conservation and the active management components. Despite system science, the amount spatially given to the environment is small and isolated and requires active management.

5.2.3 Thresholds and feedback loops linked to legislation

Case Study 1 – Environmental Flows

Although the amounts given in environmental entitlements are not in legislation as formal thresholds, the amount of water formally allocated to the environment in Victoria is listed on the Victorian Water Registrar, which is publically available on the Internet. Formally acknowledged as the next step in the implementation of environmental flows in Victoria is the process of getting the environmental entitlements to the stream or river and then monitoring to see the expected results over the next few years. In particular the index of stream condition is seen as a major threshold assessment of environmental condition of streams.

"In hindsight I think one of the key issues is strengthening the intellectual and human resource capabilities of regionally based catchment management authorities; having consistent forms of measuring and monitoring water and environmental condition across the different jurisdictional boundaries" (Interviewee WT559210). Several interviewees referred to the absence of thresholds and feedback loops related to legislation for environmental flows. It was noted that both thresholds and feedback loops did occur for water quality in Victoria in the form of State Environmental Protection Policies (SEPP) (Interviewee WT5591).

Case Study 2 – Wetlands

The Wetlands Conservation Program of Victoria had a regional monitoring component. Report cards for government programs in the 1980s were not common, so this program had more reporting than nearly any existing program in government at this time, including reporting on achieving actions and budgets defined in a clear program. The regional monitoring involved asking what has been done to protect wetlands and what the budget allocated resulted in (Interviewee WS1110 -1).

Ramsar wetlands have threshold limits of retaining "ecological character" which is prescribed under international legislation. A large amount of work had been done to define this for Victorian wetlands using the example of Westernport Bay wetland (Kellogg Brown & Root 2010). Despite this there are cases where the cost of improvements for Ramsar listed wetlands are prohibitive. An example is Corner Inlet, where the cost to upgrade catchments to assist water quality and sea grass beds would cost well over $5 million (Interviewee MP0078).

Recently wetlands have been included in a state-monitoring program. In a discussion on thresholds and feedback loops, evidence on the success of monitoring the state's native vegetation program was obtained from interviewee WS119654, which linked the importance of Ministerial interest and the continuation of monitoring of both legal and illegal clearing and remaining indigenous vegetation as important.

Case Study 3 –Marine Protected Areas.

Thresholds in the case of MPAs have been more in the form of the Auditor's General's report which is critical of the amount of management funding and resourcing given over time. It is well known in public programs that a reduction of funding in one particular subject or issues after a period of time occurs, commonly a three – year period. This example points to the amount of active management required once an area is protected as a preserved conservation area.

Overall

Interviewees referred to problems of thresholds and feedback loops for these ecosystems. Specific challenges arise from:

- The complexity of natural systems
- Being tied to an inappropriate threshold
- Government reluctance to be tied to environmental thresholds without flexibility.

Thresholds and monitoring was the criterion that was least subscribed to in the three case studies. The extended period of time taken to get spatial components allocated to the environment has contributed to this. These processes took well over 20 years, lowing the immediate importance of thresholds and monitoring.

5.2.4 Advocacy

Case Study 1 – Environmental Flows

Advocates for environmental flows need to be scientifically able and have time to dedicate to processes that are usually three years (Interviewee WTXS1110 - 2). As more and more science is required, advocates will need to understand this science. Critical to being an advocate in environmental flows is understanding of detailed hydrology and river systems that takes a considerable time to learn (Interviewee WTXS1110 - 2). In addition to the science, interviewees referred to the detailed property rights that exist for water and the fact that advocates would need to understand these as well (Interviewee WTXS1110 - 2). The water management plans are at least a three-year process, which requires commitment over that period of time (Interviewee WTXS1110 - 2). Paid advocates have allowed some inputs (Interviewee WT 559210) and scientists have paid an important role.

Key groups are the Goulburn River Group and closer to Melbourne, the Yarra River Keepers Association, which has links as an international organization (Interviewees WTXS1110 – 2 and WT55671). Perhaps the most successful advocacy group, influencing environmental flows in Victoria has been the Wentworth Group of scientists, including Professor Peter Cullen coming from a creditable academic

institution (Interviewee WTXS1110 - 2). Campaigning over several years, Peter Cullen achieved a great deal in the debate on environmental flows. Scientists in government have played a role with Interviewee WT5591 referring to the major research institute of the Department of Conservation and Sustainability as an advocate. However the major research body in state government has now been moved to be commercially dependent on other government departments. Recent changes to state funding include the dilution of research as an independent activity and a change to this being considered a commercial activity (Interviewee WT9974). "And you're linked commercially to other departments, government departments?" (Interviewee WT9974).

In addition to this, advocacy has been through National environmental groups, state environmental groups and regional environmental groups, for example the Goulburn Valley Environmental Group (Interviewee WTXS1110 - 2). An important development has been the state government funding of conservation groups to participate in the process. Interviewee WT559210 noted: "The history of environmental advocacy on flows merged out of the 1994… council was trying government's water reform agenda, where they… that's where the states got a bucket of money if they implemented reform. One of the things that Victoria acknowledged was that local environment organisations required financial support to participate in the planning processes around those." "From, probably the mid 90s the State Government resourced Environment Victoria and some other conservation organisations to participate…" (Interviewee WT559210).

Overall there are still not enough advocates to participate in government processes on environment flow decisions (Interviewee WTXS1110 - 2). The technical ability of these advocates needs to be high with training and an increase in capacity. As seen in the spatial links section for environmental flows, it is unlikely that community advocacy groups will be given control of the environmental allocation because of the high value of the resource (Interviewee WTXS1110 - 2).

Interviewee WT9974 reported that what was needed is people who would go straight to politicians and advocate. "We needed more advocacy, and we can't advocate, I can't advocate from here. And so you need good links to science. And that's the

other thing is I think the level of science has increased but it's going to have to increase even more because it's going to come under greater scrutiny. So it just needs some links with some good science people and you just need to push it in the public political sphere and be smart about it and get other groups on board.
So if it's a water issue, to get anglers on board is really essential. It's a hard thing to do but it's essential. So for the Native Fish Strategy, even though I've said that it's just got cold, the support for that, we had ACF, the anglers and the irrigators all sign a joint support media release" (Interviewee WT9974).

Similar issues were raised by another interviewee: "I think some of the key environmental governance issues revolve around managing, vertically and horizontally, the systems so that the point I'm just… is that you've got an integrated and complicated system that works that has the small-scale influences, other scales as you go up. Developing governance arrangements that are aligned across different scales of decision-making, so from catchment-scale to regional scale to state scale to federal scale is a real problem" (Interviewee WT559210).

Interviewees continued to note that "One of them might… part of it is making sure that institutions like Commonwealth Environmental Water Holder, who hold a large amount of water are properly resourced and empowered to deliver that water in the way that brings about the best environmental result possible. And that the key to that will be making sure that the lateral connectivity that rivers require onto their floodplains is that we return to notions of integrated catchment management that understand that the water needs the land and the land needs the water. And that our governance arrangements need to include, not just the management of a fraction of the landscape but that the inter-relationship between the water and the land, vice versa, that's the important thing to manage. Developing institutions that have… understand those relationships and can manage them across time and space is the challenge. But the positive thing is that we have, our existing frameworks I think are a strong institutional foundation upon which to develop those governance arrangements. That we are so far from being at ground-zero" (Interviewee WT559210).

The achievement of an amount of water allocated to the environment for management and the best use for the environment means advocacy at two levels. Firstly, everyday management of this lump of water allocated to the environment and secondly advocacy to obtain additional water for the environment. Interviewees indicated that it is unlikely that governments will allow community groups control over environmental flow entitlements since this asset of water is worth something in the order of four billion dollars (Interviewee WTXS1110-2). In order to get the most environmental benefit from this entitlement, technical and management skills are needed. It was indicated from interviewees that considerable opposition from irrigation groups would occur if environmental water was not used to achieve optimum environmental benefits (Interviewee WTXS1110-2).

Inputs from advocacy groups to the water allocation process and submissions are welcomed. Given the technical nature of what is required, there are not enough groups willing to take on this role. Catchment Management Authorities (CMAs) and water watchers were common groups, along with the Australian Conservation Foundation (ACF) and Environment Victoria (EV). Acknowledged in interviews was the amount of technical knowledge required on the hydrology of rivers and streams with irrigators fitting this bill, noting that detailed knowledge of water systems is critical to their businesses (Interviewee WTXS1110-2).

Case Study 2 – Wetlands

Interviewees referred to the increase in public awareness on the value of wetlands. Early advocates for wetland conservation in Victoria were the Victoria Field and Game Association (VFGA) with the Department of Wildlife and Game. Other advocates, consisting of the Bird Observers Club of Victoria, Wader groups and the Environment Conservation Council of Victoria (ECC), have traditionally been the support of wetlands in Victoria. The Wetlands Trust of Victoria, operating as an advocate for wetlands, had a paid coordinator by state government for a period of two years in the 1980s. The present advocacy for wetlands occurs largely through the Catchment Management Authorities (CMAs) and Bird Observers Clubs (Interviewee WS1126765), with a range of community groups (eg Landcare Groups) working on areas and activities of interest (Interviewee WS1110 -1). This reflects broad based

research that emphasises the social commitment of such groups, to do things (one out of 20), come to information sessions, and feel like they are contributing (Interviewee WS1126765).

Community groups also have important roles in wetlands that are visitor destinations, such as Coolart historical homestead that also provide support to the conservation of wetlands. The ranges of advocates are refereed to by Interviewee WS1110 -1, who notes advocacy can derive from friend groups with a local focus on a particular patch of land to statewide organisations. The range of activities that interest these groups ranges from planting on a plot of land to statewide advocacy on the threats to wetlands.

Departmental staff members have also been listed by interviewees as important in the support of wetland conservation with the achievement of a whole change of culture in Departments and the public across Victoria. This consisted of a change in the way people viewed wetlands (Interviewee WS1110 -1). Added to this, interviewees referred to key staff in the public sector and their ability to make a difference (Interviewees WS1110 -1 and WS119654). Interviewee WS119654 speaks about people in the public sector who knew what to do to get gains for the environment. The importance of staff cannot be underestimated. Interviewee WS1110 -1 said that if you were going to have success than it is essential to have the involvement of the stakeholders that are the most impacted in consultation on how environmental targets would be able to be met. A certain amount of knowledge is required to be an advocate in this area was the opinion of interviewee WTXS1110-2. It was stressed that it is necessary to keep going with consultation to the most affected people and to continue to explain the issues even if there was little chance of agreement (Interviewee WS1110 -1).

There is a very close relationship between knowledge management and advocacy with Interviewee WS1110 -1 referring to the need to interpret the questions for the general public. Professional advocates could be considered expert at interpreting things for the public. Interviewee WS1110 -1 said “They need experts that interpret these key questions to them so they understand these key questions. Then the

information that forms the answer to the question will become understandable to them."

Case Study 3 –Marine Protected Areas.

The Victorian National Parks Association (VNPA) was a champion for the 20 plus years of the campaign to achieve a marine protected areas system. Commonwealth funding of the Marine and Coastal Community Network (MCCN) was critical to the success of a MPA reserve system. "The Victorian National Parks Association has carried this through. You couldn't... others have come and gone a bit and Australian Coastal Society at the moment, we added a ... we had a Marine and Coastal Society of Victoria which ended up rolling into the Australian Marine Conservation Society, so there's been others that have been through... the Marine and Coastal Community Network (MCCN) of course carried a lot of it at the time. And _____... and I was the chair of the national reference group. So we... the MCCN carried it, ACF was very involved through Chris Smythe, and the Victorian National Parks Association (VNPA) was there. But it's the VNPA is the constant in all of this in Victoria. They have been interested since 1978. They are probably still the only one carrying the load at the moment. It's quite fascinating" (Interviewee CX58794).

The MCCN kept groups together and also engaged recreation and scientific inputs, coordinating overseas experts and providing information and media attention. "So I think as a campaign it was brilliant, it was... it took... if you ask _____ it took eight or nine years, 10 years, to get moving. If you ask me it took 20. It built its momentum, and then all of a sudden it became an idea that had found its time. And that combination worked" (Interviewee CX58794). Interviewee CX58794 also referred to the amount of time that it takes to get the community to embrace an issue: "But you could take... if you wanted to flip the coin and take it as a positive reflection, the positive reflection is they were saying that conservation is coming, environmentalism is increasing. This was the '70s. It's going to... we'll come back to this in 15 years, and we will get big parks next time, because the community will have come along. And in retrospect they were... there was an element of truth in it" (Interviewee CX58794).

Overall

Government has paid external groups to advocate for the environment in all three case studies. Commonwealth influence has reached two of the case studies, one with a paid coordinator of the major network and in the other case, the Commonwealth indirectly caused the state to fund advocacy input into state government process through it's environmental requirements. In the third case study, the state government paid for a coordinator for the Victorian Wetlands Trust. There is evidence that the advocacy has fallen off when the paid person is not there, as is the case with the Marine and Coastal Community Network (Interviewee CX58794). Interviewees referred to the need more advocates for environmental water, suggesting that resourcing is an issue.

An understanding of the science and technical information seems to be an increasing requirement for successful advocacy, along with political persuasion. Advocates need to have increasing amounts of knowledge and be able to read documents (Interviewee WS1110 -1). The LCC process has been significant because of structured public input and solid scientific background (Clode 2006). An important part of advocacy appears to be presenting information so that the public can understand and relate to it (Interviewee WS1110 -1). This suggests that knowledge management is present in these constructs with a lot of thought into the knowledge and capacity building components.

5.2.5 Knowledge

Case Study 1 – Environmental Flows

Extensive material has been presented by scientists and made available to decision makers and advocates on the reasons why the environment should be allocated water, including specific species needs for water. It would appear that this has been worthwhile with all interviewees noting the importance of science. It appears that a long time is required to get commitment across many layers, institutional arrangements, holistic scientific methods, new legislation and monitoring to prove to stakeholders that water will result in the best possible environmental outcome. This

raises questions of the amount of effort and resources to produce results. As systems became increasingly stressed, more and more science finally produced some result.

The second point is that a significant amount of information had to be collated. This process was much more than just collecting data. Gaining information required agreement across a number of parties. “So it’s too simple to say was there an environmental objective. You didn’t even know what the objectives should be. You knew you had a problem and you didn’t have a framework or a policy or the technical work to actually articulate how big it was, what the solution was, it was start on a flow program. You had to actually get a whole lot of stuff lined up” (Interviewee WTXS1110-2).

The development of a framework, policy and technical work was critical to solving this problem of environmental flows. Interviewees said that they needed to know the dimensions of the problem to line up a whole lot of information “stuff” before they could clearly state environmental objectives. This speaks about the knowledge needed to determine where the spatial amount left for the environment and the amount of the resource for other uses intersects. A clear definition in information is required for:

1. The decision of how much water the environment is going to get.
2. Management of the allocated water for the environment once the decision has been made (Interviewee WTXS1110-2).

John Paterson designed and implemented extensive knowledge projects as a key aspect of change. Involving all disciplines and changing institutions like the State Rivers and Water Supply Commission away from single focus “But the other thing that he (John Paterson) did is that he spent a lot of time on bringing information together so that the direction was then based on some… so future policies were going to be based on good sound documents. And obviously – I’m just trying to think what the environmental flows’ document was called.” Interviewee WT5591.

This work was reinforced by external factors, for example the Commonwealth government requirements – through CoAG – that the states show performance on stressed rivers, had implications for knowledge management, forcing a wider audience to be exposed to an environmental subject area. The CoAG requirements

meant that a broad range of operators in government got knowledge about environmental flows, since the state's performance in this area was tied to dollar amounts that would go to Treasury.

These actions, combined with some of the earlier work by John Paterson, especially getting rid of some institutions to evoke change away from the single focus of supplying irrigation water, has resulted in a much wider community acceptance of environmental flows. "There is now a much greater acceptance of environmental water and environmental flows and there are now allocations" Interviewee WT9974.

Case Study 2 – Wetlands

Knowledge management for wetlands was use of all different forms of the information at all levels from awareness raising to publicity. Flows of knowledge were created by seeking the highest standard of expertise in each area of wetland information to be employed in the Wetlands Unit of the Department of Conservation, Forests and Lands. Presentations at overseas and national conferences, organization of workshops and conferences and production of a Wetlands Management Manual were also undertaken (Interviewee WS1110 -1).

Case Study 3 –Marine Protected Areas.

Knowledge management was extensively used in the campaign for MPAs. Networking of groups advocating for marine areas was actively pursued through the Marine and Coastal Community network and associated with this was a well thought out information strategy that involved flows of information from overseas. This information was then circulated around groups at state and local level leading to the generation of new knowledge and understanding in this way. The use of a gradient of information from targeted factual information and iconic elements that led back to the marine environment to straight out scientific information was a powerful knowledge management technique.

Overall

Knowledge management has moved a long way in all three of the case studies from the early days of the VFGA and Bird Observers work. Knowledge management was listed as major criterion of success by interviewees and often referred to, as the key

to what is required in the future, especially information to children and the public. Also used were boundary spanners and extensive use of individuals that had reputations in areas of expertise. The vertical linkages and communications between national government and lower-level institutions (NGOs and scientists) are therefore extremely important.

5.3 The Case Data

Analysis of the case data shows close alignment of knowledge and advocacy, but with a broad recognition that science support is very important. Table 5.1 details the findings from interviews on each of the criteria of the framework for the three case studies with some quotes from interviews used as examples. Significant attention is drawn to the environmental objectives in the early phases of strategic natural resources planning. Table 5. 2 highlights the summary of case studies as assessed across the environmental governance criteria forming the framework of analysis.

Table 5. 1 Environmental governance framework applied to case studies.

Framework Case Studies	**Environmental objectives in strategic planning**	**Spatial links- Ecological techniques**	**Thresholds and feedback loops**	**Advocacy**	**Knowledge**
Environmental Flows	Objectives were to make institutional changes in the first instance. Specific allocations recommended from scientific studies for the environment not allocated as overridden by the need to supply Melbourne's water supply or irrigation. Achieved an allocation of water for the environment of 402 gigalitres (GL) water recovered from 2005 to 2010. In addition to environmental water in the Murray-Darling basin plan, probably at least 700 GL to 900 GL of water being held in Northern Victoria by the environmental water holders from 2010 to 2015 (Interviewee WTXS1110-2).	Consistent methodology for the state. Across disciplines. Based on environmental assets or values in a river and threats from flow. Six different flow components considered. Summer and winter base flows, summer and winter freshes, channel forming flows, over bank flows, and any reach of river, the combination of those and how long the duration, the height, the whatever is determined by the needs of environmental values in the reach. Expert panels to pull it all together. Took at least 20 years to develop. Detailed information and science required (Interviewee WT445890). Science under much	Auditing using the index of stream condition. This index is improved each time it is used. "We try to improve it each time we do it" (Interviewee WTXS1110-2). Audit - CMA river health management plan. To say what they have spent the money on, roughly on a three-year basis. Keen to manage the water now obtained from irrigators for maximum environmental benefit. Increasing pressure to justify the management of environmental water to achieve maximum environmental benefits and the environment treated as an asset.	Not enough conservation groups that know the complexity of the water resources well enough and have resources available to contribute. Need a commitment over 3 years to make a solid contribution. Peter Cullen from a credible scientific organisation (Wentworth Group) held in very high regard as a successful advocate. Groups were paid by state government to participate since mid 1990 as a result of CoAG. States were required to make advances in stressed rivers (Interviewee WT559210). ACF CCV	Information available on the web. Would need technical expertise to fully understand hydrology. "Much greater acceptance of environmental water and environmental flows and there are now allocations" (Interviewee WT9974). Knowledge exchanges between states eg Principles for Healthy Rivers over four years. Scientists and conferences. Network on provision of environmental flows – National. John Paterson drew together all knowledge from many sources in the 1980s. Documentation of what environmental flows were asked for and the ground lost not well publicized.

		scrutiny (Interviewee WT9974). The regimes have been set to hit minimum standard objectives, so they're at the lowest threshold or the highest level of environmental risk that the government believes they can get away with (Interviewee WT559210). Spatial component is a "lump of water that you can use in a range of different ways" (Interviewee WTXS1110-2). "a statutory volume that's allocated to the environment" (Interviewee WT55671). Tied to the Minister of Water and the statutory body, the Environmental Water Holder. Water fund made the difference. Compensation paid to irrigators to acquire water back to the environment.		Fishers Goulburn River Group Yarra River Keepers Association Often the community representative's role was to cover local interests as well as environmental interests (Interviewee WT445890). Local, vertical and horizontal advocacy required (Interviewee WT559210). Within the context of healthy rivers that all groups depended on. A high level of agreement at this broad level. Cost of environmental water $700 million, therefore management is not something government will hand over to a community group. Evidence that some of the water authorities (eg Melbourne Water) have more resources and ability to complete environmental works than others.	Amounts of water needed for the environment not easy to find (Interviewee WT445890).

		Allocation is approximately 20% of what the standard methodology has defined (Interviewee WT445890). The scientific debate has moved from 10% of regulated flow based on Stalnaker and Tennant from the states to smaller amounts that are actively managed (Interviewee WT9974). Good science required as you get more and more transparent processes (Interviewee WT55671). Agreed National principles for the protection of healthy ecosystems. Good staff and opportunistically applying their skills.		Melbourne Water now considers themselves an advocate for the environment (Interviewee WT55671). Advocates not really acknowledging in an explicit manner the amount of ground lost in the environmental flow debate. Environmental Amnesia. This supported by the comment that these amounts are the smallest amount that the government can get away with (Interviewee WT559210).	

Wetlands on public and private land.	Environmental objectives in the 1970s were to secure waterbird habitat. Objectives of the Wetlands Conservation Program for Victoria were precise and action orientated. Implementation of these 28 actions was costed and monitored. Public land wetlands subject to Land Conservation Council (LCC) recommendations and the take up of these. Objectives were not met in the case of private land – non governance. The future ability to set objectives appears to depend on funding.	Science was important in the assessment of wetlands during the 1980s. High value wetlands –scientific committee – not legislation. Wildlife reserves and Ramsar wetlands declared without large amounts of science in the 1970s. Wildlife reserves and other categories of public land, including National Parks. The Land Conservation Council (LCC) assessment – use of Corrick's survey. Scientific data important. Tenure programs, where government gives money to private landholders. Compensation Science appears to be very important in the future – have to prove even more because land used for another purpose- agriculture.	High Value wetlands linked to policy and formed something that could be monitored. Ramsar wetlands have the requirement to retain ecological character Monitoring and condition index – 2013. This data can form a base line only. High value wetlands had greater quality than representative wetlands when assessed in 2013.	Wetlands Trust of Victoria Field and Game association (1970s) – Wildlife reserves Scientists are advocates in recent years. Second stage – since reserves on public land have been established. Scientific committee – paid for by government. Wetlands Unit – drew every available expertise. Wetlands Trust – paid advocacy by government Private land – a lot depends on landholders/ farmers Not enough compensation available from government funding.	All forms of information provided from the Wetlands Conservation Program which resulted in a change in people's attitude to that habitat. Forms of information that the pubic could relate to including wetland centres and a wetlands tram in Melbourne. Interchanges at state, national and international levels. Expertise levels in the Wetlands Unit high in multi disciplines. .

Vic – Marine Reserves-public	Objectives of a marine investigation were clear. Government objectives of achieving a study were met. NGO objective of a marine parks system – met over a period of 24 years to achieve this. Bracks government – objective of a marine parks system met.	Based on basic maps and other data. Large scale agreed bioregions for Australia. NGOs had an idea of the area they wanted saved and set the objective for the campaign. Compensation to fishers very important in achieving spatial amounts as MPAs. The Land Conservation Council (LCC) process was important as it was based on solid scientific information.	Legislation exclusion of fishing. Not a multiuse park. Auditor's General's report critical of the management of the reserved areas. No government commitment to reviewing the amount of area reserved with a view to adding additional areas.	Victorian National Parks Association. Strategic and Tactical Actively involved scientists and made a place at the table for them. Strongly fought over a long period. Advocates from a broad range of industries and organisations. Eg dive, tourism. Governments can't ignore when you have a broad base. Long time period for implementation has implications for adaptive management. Effective because they had an idea of what they wanted saved before starting the campaign. They were not just responding to government. Advocates had scientists working on the spatial amount for the environment. (Interviewee MP00789).	Networking, including overseas interactions. Created new knowledge and high flows. Tagging information and separating data from information and knowledge. Targeting certain groups and creating information that these groups could relate to. Advocacy was originally by local groups for their own local area reserve.

Table 5.2 Summary of Environmental governance framework applied to case studies.

Case Study	Environmental objectives in strategic planning	Spatial links- Ecological techniques	Thresholds and feedback loops and linked to legislation	Advocacy	Knowledge Management
Case Study 1 Environmental Flows	+ Started with institutional objectives process had to be defined. Assisted by CoAG requirements.	+ Acknowledged that really only "a lump of water that you can do things with"	- +Recent monitoring.	+	- + Extensive use of knowledge management techniques, drawing together of all experts and knowledge in the area in the 1980s.
Case Study 2 Wetlands Private Land Controls	+ +	+ High value wetlands, Scientific committee. +	+ High value wetlands. Ramsar wetlands linked to legislation. +	+ Early resulted in reserves. Bird Observers. –	+ +
Case Study 3 Marine Reserves	+ NGOs clear environmental objectives.	+ State-wide	+	+ + Strong	+ Linked to spatial components that the public relate to.

Symbol	
+	Present
-	Not present
- +	Limited
+ +	Present, Strong and Persistent

5.4 Environmental Governance and Coasts

To use these findings regarding elements of environmental governance in the application to coastal management in Australia, the five criteria were applied to a desktop study of Australian coastal management. The history of coastal environmental governance is presented in Harvey and Caton 2010, and other researchers have presented more limited time periods of historical narrative on Australia's coastal managements and environmental governance (Haward 1994, Haward and VanderZwaag 1995, Wescott 2000, Gurran et al 2007, Haward and Vince 2009, Wescott 2012). Of the three layers of government in Australia, the state and territories governments are reported as having the most powers in respect to coastal management (Harvey and Caton 2010). They note "state and territory governments have the most significant powers relating to coastal management in Australia, and this is expressed in a wide range of legislation" (Harvey and Caton 2010, 224).

5.4.1 Environmental objectives in strategic planning - Australia's coasts

Environmental objectives in strategic planning have had a history in Australia. Initially strategic planning work was undertaken on a project-by-project basis on a small area scale. This changed in the 1980s with increasingly connections between studies and an emerging movement of holistic management; "integrated catchment management" and "integrated coastal management" and is played out in current environmental management as regional natural resource planning over larger areas (Harvey and Caton 2010, 5). Both in Australia and overseas a regional natural resource approach have been used to solve some of the institutional complexity of environmental governance (Dale et al 2013, 3). Construction and development projects driven by sectorial interests have been required under legislation to undertake environmental assessment or environmental impact statements without considering cumulative impact or overall environmental objectives for an area (Fisher 1980).

As referred to in Chapter one, the main planning mechanism for coastal management in Australia is Integrated Coastal Zone Management (ICZM). In theory, environmental objectives would then be formed under this holistic management and

planning. Gaps in the implementation of ICZM in Europe were noted by Shipman and Stojanovic (2007) leading to the conclusion that several failures exist including a lack of action at the implementation stage, finance mechanisms, and lack of involvement of stakeholders and the community (Shipman and Stojanovic 2007, 390). The factors considered to be the most important in ICZM are detailed in Cicin-Sain and Knecht (1998). Following the adoption of integrated coastal management in Australia as the major type of management for the coast, the Commonwealth of Australia introduced a national coastal policy in 1995. This policy was based on the principles of sustainability and integrated catchment management (Harvey and Caton 2010, 148).

Tracing the development of overarching Commonwealth coastal policy, Foster and Haward (2003), Haward (1994) and Harvey and Caton (2010) refer to the Resource Assessment Commission (RAC) work in the area and the extensive RAC reports in the lead up to the release of the policy. Outside the RAC process other reports were influential. One of these reports, *The Injured Coastline*, by a Commonwealth parliamentary committee, was tabled in Parliament in 1991 referred to the failure to deal with the cumulative effects of developments "the tyranny of small decisions". (Harvey and Caton 2010, 208). This report shows that while there was movement towards holistic planning over an area, setting of environmental objectives for each ecosystem and a process to action these objectives have been missing. *The Injured Coastline* provided a clear, short statement of the major problems of coastal zone management in Australia:

- piecemeal development and the failure to consider the cumulative effect of developments – 'the tyranny of small decisions'
- fragmentary and uncoordinated coastal management arrangements; multiplicity of agencies
- conflict amongst users of the coastal zone, and disillusionment with consultation
- lack of action by government agencies; and poor levels of knowledge of coastal processes and poor communication between scientists and managers (Harvey and Caton 2010, 208).

Objectives at a national level were part of the National Coastal Action Plan released in 1990, which was one of the major outcomes of the RAC reports. The establishment of a National Body, also a recommendation from the RAC reports did

not eventuate due to opposition from the states (Harvey and Caton 2010). The Ministerial Council endorsed the National Cooperative Approach to the Coastal Zone Management strategy framework and implementation plan for coasts in 2003 that provided principles for management and coordination, including funding (Natural Resource Management Ministerial Council 2006). This document states, "The fundamental goal of ICZM is to maintain, restore or improve the quality of coastal ecosystem and the societies that support. A delineating feature of ICZM is it seeks to address both development and conservation needs within a geographically specific place - a single community, estuary or nation – and within a specified timeframe" (Natural Resource Management Ministerial Council 2006, 7). Despite this coordinating document, objectives have remained very broad and general without environmental objectives that are consistent with conservation and preservation of ecosystems, a major aim of the coordinating framework and implementing document.

Gurran et al (2007) concluded that policy priorities for coastal planning in Australia need to include specific objectives and controls to manage environmental impacts of coastal development (Gurran et al 2007, 463). At the planning level Gurran et al (2007) identify the need for specific objectives relating to the environment as well as protection measures as seen below. "The earlier discussion of amenity migration and its impacts in coastal communities, highlights several policy priorities for coastal planning and management within these contexts, including the need to articulate specific objectives and corresponding legal imperatives to manage the environmental impacts of coastal development in non-metropolitan areas, particularly protection of coastal habitats; contain urban sprawl; avoid or mitigate coastal hazards; and integrate environmental rehabilitation, management, and preventative (i.e., regulatory) measures" (Gurran et al 2007, 455).

In summary overarching policy and planning documents for Australia's coasts lack explicit environmental objectives as stated principles or as a guiding process. The tendency in coastal management and governance at the national level has been on processes under an integrated coastal management approach without emphasis of setting environmental objectives.

5.4.2 Spatial links- Ecological techniques and environmental governance of Australia's coasts.

In the case of coastal environmental governance in Australia, there is an absence of ecological methodology covering all of the major ecosystems linking to the amount of habitat reserved for the environment. Certainly a linking of a methodology to components that the public can relate to is lacking. There appears to be a lack of science input to coastal management in Australia for each major spatial ecosystem type of the coast. Harvey and Caton (2010) report a lack of knowledge on:

- Coastal dunes
- Seagrass
- Mangroves coasts
- Estuaries
- Saltmarshes
- Cliffs and shore platforms
- Native vegetation on coastal strips
- Coastal catchments

For instance coastal dunes exist behind sandy beaches and with just over half of the beaches in Australia reported to be of this type (Harvey and Caton 2010, 74). "Science on these dunes is not extensive. Some dunes are well vegetated and stable, for example dunes near climate rainforest in north Queensland" (Harvey and Caton 2010, 76). There is little evidence of a focus on what habitat should be allocated for the environment for each ecosystem. Issues of connectivity that may need to be considered, especially in response of climate change are generally not seen in discussion on these ecosystems (Dale et al 2013). Some general discussion on these issues is seen in the white papers on biodiversity in Victoria.

5.4.3 Thresholds and Feedback loops and environmental governance of Australia's coast.

State of environment reporting has been the major form of recording of environmental thresholds for the coasts of Australia (Harvey and Caton 2010). "Australia lacks the integrated national systems and databases to measure environmental quality, manage it, and evaluate the effectiveness of that management. Until these deficiencies are rectified, we will remain unable to truly answer the question of whether our pattern of development is really sustainable" (Harvey and Caton 2010, 268).

The Commonwealth state of the environment report of 2011 is the most recent of these and compiled the current amounts of information that is known about the coast. The 1995 State of Australia's Marine Environment report (SOMER) looked at the condition of parts of the coast and has been seen as a bench marking exercise with assessment of 83 technical reviews (Foster and Haward 2000, 550). Recommended in the report was a repeat of this exercise at a future date in five years time to provide a comparison (Zann 1995, 1996). This exercise has not been carried out (State of the Environment Committee 2011).

5.4.4 Advocacy and Environmental governance for Australia's coasts

The advocacy for environmental preservation of components of the coast by major NGOs in Australia is not large in comparison with other issues and areas in Australia. Harvey and Caton (2010, 240) reported that the major NGOs in Australia have other environmental issues that they are devoting more time to than coasts. Part of this lack of attention appears to be related to the conservation movement in Australia that appears to be wilderness focused with significant interest in endangered species (Harvey and Caton 2010, 240).

A key component of management of the coast at the national level is Coastcare. A commonwealth funded program, primarily delivering on–ground works, Coastcare involves local communities and there are indications that this may need further strategic planning so that regional priorities are taken into account (Harvey and Caton 2010). Therefore community groups are focused on area based projects and the management of coastal reserves and have little information or process that would allow them to be involved in wider based campaigns for preservation of components of the coast. The tradition of use of coast for surf life saving and recreation has seen an interest in the coast by local groups and campaigns for pollution control especially in estuaries and as a result of sewage. Two sites, Fraser Island and the Great Barrier Reef remain icons of public concern and advocacy (Harvey and Caton 2010, 241).

Wescott (2011) gives a summary of advocacy for the coast and points to national bodies and groups at a local level. Examples include both government and non-government groups. Advocate groups target "the political agenda and disseminate ideas" (Wescott 2011). Harvey and Caton comment "for many years there has been

an awareness of the loss of pristine coastal environments: and there is no doubt that, for example, Nancy Cato's voice has resonated more widely than over the despoliation of Noosa alone" (Harvey and Caton 2010, 242). These concerns were presented in the Injured Coastline (HORSCERA 1991) and the Resource Assessment Commission (RAC 1993), two important Commonwealth government inquiries into the Australian coastal zones. Harvey and Caton note, however, that "in spite of a rise in profile during the 1990s, coastal and marine issues have not been core business for Australia's main green groups; however, they have been a particular focus for a multiplicity of resident local user groups around the continent, and in the Northern territory for Aboriginal Australians" (Harvey and Caton 2010, 242).

Coastal issues have rarely attracted the attention afforded the more politicised campaigns over wilderness preservation or rainforest logging. It is clear, however, that the last three decades have seen increasing concern over the state of Australia's coasts, particular in relation to near shore marine and estuarine pollution (Harvey and Caton 2010). "On occasions, particular coastal places have been the focus of national attention: it could be said that the Great Barrier Reef and Fraser Island have attained icon status within the national treasury of natural heritage places and have frequently been the subject of concern" (Harvey and Caton 2010, 242).

5.4.5 Knowledge and Environmental governance for Australia's coasts

Harvey and Caton (2010) noted that the *Injured Coastline* Report of 1991 highlighted "poor levels of knowledge of coastal processes and poor communication between scientists and managers." The Commonwealth has assisted with significant amounts of resources to get basic information and capabilities in coastal management. Through the 1990s and early 2000s, the Commonwealth government funded information bases for coastal management, conference and short courses, the Coasts and Clean Seas Program and encouragement of the community through the Coast Care program (Harvey and Caton 2010, 210). State government agencies are also major sources of knowledge. Harvey and Caton (2010) recognise that these agencies have a wealth of expertise and data: "the expertise of the state agencies is a significant part of Australia's capacity in coastal zone management" (Harvey and Caton 2010, 210).

Table 5.3 Environmental governance framework applied to Australian coastal management

Environmental objectives in strategic planning Assessment (-)	Spatial links- Ecological techniques Assessment (-)	Thresholds and feedback loops Assessment (-)	Advocacy Assessment (-+)	Knowledge Assessment (-)
Commonwealth coastal policy and other overarching documents based on principles of integrated coastal management and sustainability Strategic Planning documents limited in explicit environmental objectives (Shaw 2008, 2010). Decision not to have a National Coastal body. "There are no systematically derived regional objectives for marine biodiversity to guide strategic planning or management". (State of Environment Committee 2011, 442)	Coastal ecosystems have limited scientific information. Limited methods for determination of the amount of habitat that will be allocated for the environment. For the marine environment of the coasts: "In addition to national-scale biodiversity problems, there are many more habitat and species issues in smaller local areas. These judgements are based on a generally low level of certainty, with most of the available knowledge linked to fished species and threatened species. A much more detailed national assessment of marine biodiversity is required to properly clarify the nature, extent and significance of the condition of our marine biodiversity" (State of the Environment Committee 2011, 396)	State of the Marine Environment in 1995 reported on the estimation of the extent of degradation of the environment (Zann 1995, 1996). Recommendation of this report was for a follow up report to be done. This recommendation has not been followed through (Zann 1995, 1996). A vertically and horizontally integrated national system for marine conservation and management is widely seen as a critical gap in management" (State of the Environment Committee 2011, 442)	Advocacy for coasts does not have the emphasis that forestry and other issues have in Australia (Harvey and Caton 2010, 242). Community concern exists for clean and safe recreation beaches, foreshore facilities, beach access, and dune conservation. Information on coastal ecosystem decline is limited and is not presented actively to advocacy groups There is evidence that groups have mourned the loss of pristine coastal environments however advocates appear to have little process to input their concerns (Harvey and Caton 2010, 242). Distrust among the sectors … and the community critical gap in management" (State of the Environment Committee 2011, 442)	Knowledge management, reported lack of flows in information between scientists and the general public.

Key to Assessment

Symbol	
+	**Yes / Present – (Advocacy –more than one group's support); Habitat Assessment and other criteria - high value**
-	**No / Not present**
-+	**Limited**

5.5 Conclusion

Some scholars have presented environmental governance as a complex policy challenge with divergent stakeholders, multiple problem causes and fragmented institutional settings (Reed 2008) “Emergence of this class of policy challenge is characterized by complexity and contestation originating from multiple problem causes, divergent problem perspectives and solution strategies, and fragmented institutional settings.” “Environmental problems are typically complex, uncertain, multi-scale and affect multiple actors and agencies”(Reed 2008, 2417). An example may be work on the Great Barrier Reef referred to as having case stakeholder interests and values horizontally in the region with vertical government operating across different scales. There is a call for “efficacy of solutions and governance arrangements” in addition to adaptive strategies and approaches as necessary” (Vella et al 2011).

From the preceding analysis we can identify case studies that rated over all five of the environmental governance criteria. The Marine Protected Areas case in particular shows that where an achievement for the environment was made, compensation to existing users was important in the achievement.

The data analysed in this chapter provides support to a two-fold presentation of a framework for environmental governance as;

- Useful to assess which criteria are not met and upgrade this to gain an increase in success for the environment
- Use of the experience in other areas to learn and readjust to get a better result for the environment.

Chapter six gives conclusions and summaries, opportunities and challenges to applying the framework to coastal management in Australia and a synthesis checklist for application.

Chapter Six

Conclusion

6.1 Introduction

The definition of environmental governance used in this thesis is "the means by which society determines and acts on goals related to the management of the environment. It includes instruments, rules and processes that lead to decisions and implementation" and incorporates " all kinds of measure deliberately taken to prevent, reduce and/or mitigate harmful effects on the environment" (Driessen et al 2012, 2).

Many researchers have referred to the complexity of environmental planning and management and labeled environmental problems as "wicked problems" (Head 2011, 110, Lee and Thynne 2011, 76, van der Wal et al 2014, van der Walet et al 2013, 1). In some cases this refers to a lack of a clear definition of the problem (Rittel and Webber, 1973). Coastal management appears to be one of these complex problems where the multi-faceted nature of the "problem" provides challenges in developing solutions. If we can unpack the problem then there is a higher likelihood of it being "solved" and improvement for the environment. This thesis has looked at the utility of governance to assist unpacking the problem and finds that the definition of governance, including both government and non-government actors and processes helpful. The process orientation and inclusive definition of governance allows a greater probability that things important to understanding these complex problems will be included.

Despite this utility of governance to assist in unpacking complex environmental problems the present lack of attention to performance in environmental governance approaches is a limitation. Contributions to assist the achievement of environmental goals within an environmental governance framework appear to be missing. Searching multidisciplinary literature to find criteria that if applied would assist, resulted in five criteria, with the definition of criteria as something that is met or

unmet. These are key criteria that theoretically influence getting outcomes in environmental governance. Two of these criteria (advocacy and knowledge management) are likely to involve non-government, which means that they could have been missed if not using a governance frame. The other three criteria, environmental objectives in strategic planning, spatial links – ecological techniques and thresholds and monitoring, encompass both science, natural resource management and management.

Testing whether the five criteria are important in achieving environmental goals occurred by applying them to empirical examples in the Eastern Coast of Victoria. The criterion of having environmental objectives in strategies is unmet in this example. In this case the major environmental threats have been analysed for corresponding explicit environmental objectives in strategic planning. The criterion of environmental objectives is not present in the study sets the scene for further investigation.

This research has deliberately focused on case studies over relatively long (70 to 130 year) time periods. Seeking to identify critical aspects in achieving environmental goals, this work developed key criteria central to this purpose. These criteria were applied in broad scale to the South East Coast of Victoria, and then to more detailed case studies that addressed the development and achievement of environmental goals. This approach also allowed analysis and comparison between the case studies. A final stage was to return to coastal management more generically and utilise the information and data obtained in earlier stages to develop checklist to assist with the addressing environmental management of the coast. This approach addressed shortcomings of project level assessment of natural resource management that examines environmental impacts within relative short time frames. A simple qualitative scoring of the analysis presented in Chapter Five highlights general trends and is presented in Table 6.1, below.

Table 6.1 –Summary Results Environmental Governance Case Studies

	Environmental objectives in early phases of strategic natural resources planning	Spatial link-Minimum Habitat Assessment	Thresholds and feedback loops and linked to legislation	Advocacy	Knowledge Management	Environmental Goals met
Case Study 1 **Environmental Flows**	+	+	- +monitoring introduced in 2009	+	-+	Yes, 27+yr
Case Study 2 **Wetlands**	+	+	+	+	+	Yes, 5 years in 1978 to declare wildlife reserves Yes High Value wetlands
Planning controls private land	+	+	+(planned)	-	+	No
Case Study 3 **Marine Reserves**	+	+	+	+ +	+	Yes

Key	
+	Present
-	Not present
-+	Limited
++	Yes but strong and persistent

Table 6.1 shows that at the broad level the key criteria are present to some degree in each case study that involved a public resource or a combination of public and private resources. It is worth noting that environmental goals have been met over long time periods in these case studies. It is acknowledged that this does not provide definitive evidence on key criteria of environmental governance over time, however clearly these attributes have played a role in the meeting of environmental goals. Thresholds were only just being introduced in the case studies after implementation of a habitat component for the environment commencing after 30 years of work. In the case of Ramsar wetlands, further work on defining ecological character by Kellogg, Brown and Root in 2010, set up monitoring formats and limits of

acceptable change for wetlands in this international category of protection (Kellogg Brown & Root 2010).

In the case of the introduction of planning controls for wetland on private land, all the criteria are met except the advocacy criteria. For these controls to be bought in, it would have been necessary to keep information to a few actors. This was desirable to stop clearing on wetlands prior to the enforcement of planning controls. There was no public advocacy for these controls, although major stakeholders had agreed to them prior to attempts for overnight controls via restricted government consultation to major groups.

6.2 Achievement of Environmental Goals

The detailed results of the extent to which the case studies met environmental goals are seen in Table 6.2 and are a summary of the work in Chapters 2, 3 and 4.

Table 6.2 Environmental Goals.

Case Study	Goal Established - **Date**	Goal Completed - **Date**
Environmental Flows	National recommendation for instream uses to be incorporated into decision-making……..**1983**	265,905 ML of environmental water at high reliability held by the Victorian Environmental Water Holder (VEWH) as of 30 April 2012……**2012**
	Environmental flow investigation downstream of the Thomson Dam ……...**1978**	Environmental flow of 50Ml/d in Winter Months 120Ml/d in Summer Months at the Narrows, Thomson River. (Gippel et al 2005)…….**1986**
	Legal entitlement for Environmental Water Discussion Paper, released in September 1986 (Interviewee WS1110 -1, FAO 1995)……..…**1986**	Water Act 1989 Provision for The Environmental Water Reserve……..**1989** Establishment of an environmental water reserve (Environment Defenders Office 2010)……..**2005**
	Awareness of Environmental Flows concept by water resource engineers non –existent (Interviewee WT887322)……..**1978**	Water industry, including irrigators aware and working with environmental flows (Interviewee WTXS1110 -2)……**2011**

Wetlands Public land	Protection of wetland habitat for hunting……**1973**	54 Wetland Reserves purchased by the Victorian Field and Game Association (VFGA), later to become wildlife reserves…….……**1978**
	Goals for wetland conservation under the Wetlands Conservation Program. 28 Actions under the Wetlands Conservation Program **1988**	26 Actions of the Wetlands Conservation Program completed……. **1992**
	Wetlands Conservation Program 1988, State policy gives High Conservation Protection to High Value Wetlands.	High value wetlands found to have conserved state in comparison to representative wetlands – (Commissioner for Environmental Sustainability Victoria 2013). [Not assessed until 2013 due to a lack of monitoring prior to this]
Private land	Planning Controls (1983)	Goal not completed (1990). No further attempt to introduce state wide planning controls for wetlands, NRMs identifying and protecting high values wetlands.
Marine Protected Areas	Commitment to a study into areas of protection for Marine Environment (Wescott 2006, 915)…..**.....1982** A system of Marine Protected Areas. Goal established by NGOs prior to government commitment.	Goal not completed until after 1991 when the Government instructed the Land Conservation Council (LCC) to undertake a study. This study was completed in 1993 (Wescott 2006, 915)…....……...**1993** 5% in high conservation protection (Wescott 2006, 210). …….**2002** The area protected in marine parks has remained. The area in Marine Parks has remained unchanged since 2002 (Commissioner for Environmental Sustainability Victoria 2013)……**2013**

The second, and related, research question – how can these criteria be applied to coastal management? – shifts the level of analysis.

Coastal management at a wider scale for Australia, while not represented in Table 6.2, is reported as lacking in environmental objectives and goals at this broad scale,

although there are plenty examples of smaller project success (State of the Environment Committee. 2011, 442).

In further analysis of empirical data from the three case studies it was found that there was further information under the criteria, indicating more detail about what was present in the cases of achievement of environmental goals. This assessment has been undertaken for the cases where there is achievement of goals and the results are presented in Table 6.3.

The key conclusions drawn from this research are that in cases of achievement of environmental goals, environmental objectives can be developed outside of government. The importance of science, paid advocacy and knowledge in formats that the general public can relate to was found to contribute to successful environmental governance in the case studies. In addition it was noted that lengthy implementation periods made the development of thresholds and feedback loops extremely unlikely. Difficulty in developing robust thresholds and government leaning towards flexibility in their future resource management also appear to be factors in a lack of thresholds and feedback loops. These results give more detail about factors within the criteria for success in environmental governance and elaborate further the criteria. These results will be used in the checklist developed for environmental governance of coasts and focus attention on achievement of environmental goals.

Key trends have been observed from the case studies and an overall summary is presented below in Table 6.4. The overall summary of results provides a clear position of findings important to achieving goals in the three case studies. Of merit are demand for state-wide and national wide ecological techniques that result in recommendations on the spatial allocation of habitat and the time taken for their development. This leads to trends and the observation that an increase in the level of science input has been required in these case studies to obtain a smaller and smaller amount of habitat reserved.

Table 6.3 – Environmental Governance Assessment

Component	Assessment
Environmental objectives in Strategic planning	a. Apparent following the development of techniques and wider policy frameworks for resolution of resource conflict b. Linked to wider sustainability 'catchcrys' with benefits for wider audiences c. Not always defined and developed by government d. Drilled down to smaller spatial components over time
Spatial links – ecological techniques.	a. Extremely long time leagues to get implementation of recommendations on habitat to the environment over the last 30 years b. Early allocation (40 years ago) of large spatial reserves of habitat without sophisticated ecological techniques c. Science recognised as increasingly very important and valid d. Increased pressure to get state-wide, national wide agreement on techniques e. Diminishing value of reserves due to environmental threats outside of reserves f. Future work on ecological techniques linked to what threats are likely g. Ecological techniques related to assets in recent times h. Increase to all ecological elements in studies
Thresholds and feedback loops (linked to legislation)	a. Minimal monitoring and establishment of thresholds as pressures on the resource grow and spatial areas for the environment take up to thirty years
Advocacy	a. Commonwealth funding instrumental in determining if an advocate exists or not b. Networking of groups is important c. Complete determination and sovereignty over the environmental component unlikely because of the high value of the resources and the control of government d. Government control over the opportunity cost of losing control e. Success from linking to what the public can relate to f. Campaign networked and worked out over 20 years g. Scale of operation for advocacy important with consideration of vertical and horizontal spatial components
Knowledge management	a. Campaigns to increase public understanding of the environment were important to success b. Scientific information was successfully presented in ways that the public could relate to c. Overseas involvement in ideas for success d. Information presented in all ways and linked to recreation uses of the resource

Some trends have been observed from the case studies and an overall summary is presented below in Table 6.4. The overall summary of results provides a clear position of findings important to achieving goals in the three case studies. Of merit are demand for state-wide and national wide ecological techniques that result in recommendations on the spatial allocation of habitat and the time taken for their development. This leads to trends and the observation that an increase in the amount of science has been required in these case studies to obtain a smaller and smaller amount of habitat reserved.

As seen in Chapter one, spatial links – ecological component is important to nearly all the elements of environmental governance. Table 6.4 indicates that significantly more science is being required to substantiate claims for areas to be conserved and the amount requested to be believed as a reasonable amount for the environment. More environmental risk is being taken with a small amount of acknowledgment and publicity. This is not to take away from that all criteria in Table 6.4 point to the need for science.

6.4 Summary of the results

Summary	Overall summary	Importance of Science	Trend
Environmental Objectives	Environmental objectives are important to achieve environmental goals. They may not be achievable unless broader principles and structures are in place.	Increased amount of science in the definition of objectives for smaller components of habitat.	Environmental Objectives required for smaller allocations of reserved habitat with increased amounts of supporting science. State-wide policy and institutional arrangements, including wider sustainability frameworks required prior to agreement on environmental objectives
Spatial links – ecological techniques	Long timespans to achieve implementation. Increase in ecological techniques required for designation of reserved habitat since the 1950s. All ecological elements in studies. Scientists agree that more than one scientific method is valid, however demand is for state-wide and national accepted ecological techniques if habitat reservation is to be agreed.	Science very important and demand for an increase in the amount before determinations are made. Movement to all-ecological components from single ecological component techniques	Increase in the amount of science required to make a case for a smaller amount of habitat reserved. Multi dimensional from one ecological component to many in ecological techniques.
Thresholds and feedback loops	Lengthy implementation periods (over some 30 year periods) made the development of thresholds and feedback loops extremely unlikely.	Science found to be important in the determination of thresholds. Ecological processes difficult to completely pin down into a threshold.	Amounts as reserved habitat taking extremely long periods of time. State-wide monitoring of wetlands commenced in 2013.
Advocacy	Paid advocacy important to success, especially in the achievement of networking and campaign.	The requirement to understand science by advocates is high.	From single group focus to networking and campaigns
Knowledge management	Creating flows of knowledge by networking were important in successful campaigns. Presenting data in forms that the public can relate to was important to success.	Scientists important in processes of knowledge. Science presented so that people can understand	Strategy on linking overseas knowledge and presenting data so the public can relate.

6.3 Opportunities and Challenges for the application of the Framework to Coastal Management in Australia

As seen in the introduction, coastal management in Australia has a number of defining factors that may also be considered challenges and opportunities related to implementing the framework in Australia.

Challenges are

- Three tiers of government;
- Increasing urbanization, population growth, and associated catchment management issues;
- Planning on private land that appears piecemeal in its approach to conservation of the coast;
- Planning for large-scale increases to employment and growth that may proceed without due regard to the environment;
- The education and orientation of planners that is focused away from sustainability;
- A regulatory planning system that depends on the prevention or modification of inappropriate proposals (Gurran, Squires and Blakely 2008);
- The lack of an economic trigger;
- Recent use of off-sets to provide an adequate environmental solution to loss of habitat;
- State government's clear mandate as key in governance of the coast;
- Expectations of local government dealing with environmental management and operational tasks without expertise or wider policy and statewide methodologies.

Opportunities are

- Spatial orientation and the fact that the management of the coast will always relate to areas on the ground and catchment processes;
- The State of the Environment Report 2011's statement of the need for a solution to environmental governance for the coastal areas of Australia;
- The growth of social media and the associated increasing demand for environmental governance outside of government;
- The call for an increase in efficiency between the three layers of government;
- Climate change and sea change and the directives of the National Sea Change Taskforce;
- Retirees in the population interested in advocacy;
- Scarcity of land for development and housing and the government's role in the provision of the land for housing and development.

The framework assists these challenges and the opportunities for Australia's coasts in the following ways. The key is the ease that this framework can be used across all three tiers of government to establish agreement on movement forward in environmental governance for coastal management in Australia by placing

importance on the five criteria in the framework. The framework clearly addresses urbanisation, population growth and catchment management by explicitly drawing attention to the definition of ecological techniques linking to the spatial component of the environment that will be preserved.

The education and orientation of planners regarding environmental sustainability becomes clearer using criteria of ecological techniques linked to the spatial component of the environment and environmental objectives. The clarity of what will happen to these environmental objectives over time provides accountability and flags for planners to encourage thought that is broader than process. Ecological techniques are also the key to understanding if offsets would be able to be used in certain instances to address the spatial amount of habitat to be preserved. Economic triggers in future Australian coastal management are likely to be port development or other major projects, such as transport and housing development. There would be significant advantage of implementing this framework to allow ecological technique work and associated policy and structural work to be done in association with these major projects.

An environmental governance checklist seen in Section 6.4 further enunciates these possibilities by breaking down actions that would be required to implement the framework. This checklist is presented below. Features of this checklist are;

- The facility of each of the three tiers of government to commence parts of the five criteria framework of their own choice and move forward over time with associated resourcing issues;
- The highlight of timing to seek other government tier involvement and the specification of actions required;
- The recognition of the importance of non-government bodies and citizens in advocacy without restricting this role to a type of agency or body, whether that be government or non-government.

6.4 Environmental Governance checklist

Analysis of the case study data also enabled a checklist for environmental governance to be developed. The checklist on environmental governance utilizes the key criteria in the framework and is present in Table 6.5. This checklist has been designed to commence at a lower level of resourcing and expertise. These lower levels are to be built upon and provide the means of discussion with different levels of government. Level 4 requires the lowest level of resourcing and commences the documentation process to find out what is already there and provide clarification of this to parties, both government and non-government. This also achieves the aim of getting the different parties communicating with each other. It is possible that this level may be undertaken at the local government level with consultation with state government. Level 3 is also achievable with a low level of resourcing, however requires coordination skills and focus.

The establishment of environmental objectives at a 50% level requires scientific studies that need considerable resources and state government coordination of statewide assessment techniques and overarching policy. The commencement of these policies and technical/scientific support at this level is consistent with Stokes and Faulkner (2011) survey of local government employees in Australia with the result of requests for both state and national policy from these workers. Level 2 recognizes the importance of paid advocacy and the large advances to be made in networking. Knowledge management techniques of providing interaction of staff, increasing expertise and also assisting with statewide interaction are also commenced at Level 2. The amount of resourcing required to undertake Level 1 is considerably more than the resourcing to undertake Level 4.

The provision of paid advocacy (from either national or state sources) provides a quantum leap in performance. Research shows that the achievement of state-wide scientific assessment procedures may take some time as well as give valuable education to people outside of environmental areas. Avoidance of this difficult work would not appear to be a suitable long-term strategy. Research shows that threshold and feedback loops may be difficult to establish, so they have been included in the early stages of this checklist to encourage further discussion and thought.

Table 6.5 Checklist for Environmental Governance of Australia's coasts

COMPONENT	CRITICAL ISSUE	Level 1	Level 2	Level 3	Level 4
Environmental objectives in Strategic Planning	Strategic Planning with explicit environmental objectives. Goals of the work.	Identify all major Environmental issues with 100% of major environmental issues listed in strategic plans as objectives.	50% of major Environmental issues listed in strategic plans as objectives	Planning on all major environmental issues is traceable.	Audit checklist of key environmental issues against the objectives of current government plans.
Spatial links – Ecological techniques	Measurement of Environmental Governance. Return on effort and resources. Diminished return if levels decrease overtime. Scientists accept a variation in methods. Policy tends to require state-wide and national agreement on techniques. This is concurrent with wider public understanding of the issues and importance of the environment.	Scientific assessment with recommendation on amount of habitat for reservation in place. Scientific assessment technique agreed nationally. Attention to additional threats to conservation that are not seen in habitat retention in the first instance eg air and water pollution.	Scientific assessment with recommendation for amount of habitat reserved in place. Scientific assessment technique agreed at the state level.	Scientific assessment with recommendation for amount of habitat reserved in place. Scientific assessment technique at the regional scale.	Scientific assessment with recommendation for amount of habitat reserved in place. Scientific assessment technique at the local scale.

Thresholds and feedback loops	Natural Resource Targets and reporting. Advocacy unable to operate without measurement.	Natural resource targets for 100% of key environmental areas. Reporting and modified action to modify result.	Natural resource targets established for 75% of environmental issues and reporting on these issues every 5 years.	Natural resource targets established for 50% of environmental issues.	Natural resource targets established for 25% of environmental issues.
Advocacy	Environmental advocacy. Advocacy from non-government and government. Increase demand for environmental governance from the public.	Advocacy funded from independent government source, preferably Commonwealth. Group performing an environmental advocacy role in conflict with /and putting an increased environmental angle from what would exist in the planning process. Legal statue for advocacy.	Advocacy funded from independent government source, preferably Commonwealth. Group performing an environmental advocacy role in conflict and achieving an increased environmental angle from what would exist in the planning process. Legal statue for advocacy under discussion.	Nominated entity that is performing advocacy role but no legal statute for advocacy. Group performing an environmental advocacy role in conflict with /and putting an increased environmental angle from what would exist in the planning process.	Entity or entities can be identified as environmental advocates.
Knowledge management	Effective use of data, information and knowledge to achieve environmental governance. Decision support tools. Advocacy engagement	Linkages made to databases and professional associations to ensure a list of all known data sources for environmental components of coastal management. International flows of information. Public presentation in ways that people relate to.	Connections made with other strategic coastal planners that have 50% of ratings Level 1 in this table. Active science link to key researchers that are engaged in the issue.	50% of databases and models applicable to the scoped area being actively used. Group meetings where the strategic planners are actively engaging information.	Documented as a process. Discussions between scientists, academics and planners. Pinpointed and recording of which databases have been utilized. This may take the form of a decision support tool.

6.3.1 Environmental objectives

Level 4 for environmental objectives in Table 6.5 is an audit check to determine what environmental objectives currently exist and requires the identification of major environmental issues in a region. This becomes the basis for future work. It is recognized from case studies that achieving Level 1 will require state-wide policy frameworks to resolve conflict in place with broader sustainability frameworks 'catchcrys' that nearly all public and parties can agree to.

The absence of environmental objectives in strategic plans may alert to the need to establish environmental objectives in state or national polices, and agreement of broad principles and policies. Indications are from the case studies that a 'whole lot of work' would need to be done, establishing what is to be protected, the science and technical support for the case to protect it and broad institutional and policy frameworks that look at resolution of conflict.

Not all environmental objectives will be established by government, however in a large amount of cases, as the process goes forward, scientific information will become important in specification of objectives. This information will require agency, contract professionals or volunteer scientists to do this work with possible implications of funding from government.

6.3.2. Spatial links – Ecological techniques

The case studies indicated that definition of a recommendation for the environment based on science is required for success in allocation of this environmental requirement. The high value placed on science as having credibility in negotiations was proven important in this determination with more science for less component of reserved environment as a trend. The levels in Table 6.5 for spatial links – ecological component also include agreement on the technical method used for an ecological technique. This is because the degree to which agreement on the technique used was recognized does seem to be a factor in success. The amount of publicity and

knowledge gained from actors outside of the immediate environmental field to gain acceptance and understanding is important. The government processes at both national and state level are the designated roles for this. State government has governance oversight on major decisions of resource allocation for the coast of Australia and therefore across government sectorial support is required, not just environmental government agencies. A great deal of importance in the checklist has been placed on the agreement of the ecological techniques used across the tiers of government since the case studies have shown government process at wider policy levels in the pursuit of environmental goals require this as part of their priority setting. It appears unlikely that government levels with access to resources, including finances, will make these available without this agreement on ecological techniques.

6.3.3 Thresholds and feedback loops.

Given the long league times for implementation of reserved amounts for the environment and the associated absence of thresholds in the case examples, it is suggested that this area is in its infancy and that government may have little interest. The high standard of science for increasingly smaller results and government command over the opportunity costs of the resource are illustrated in Table 6.3. Table 6.4 suggests the most basic way to tackle thresholds. As suggested by the critical issues, the focus of this work would be two fold;

- Science basis for improvement of the environment
- Assist with advocacy, which has requirement for quality science.

6.3.4 Advocacy

Dedicated advocacy is important. As some of the environmental objectives were not from government sources, they required NGOs to advocate and develop environmental objectives that may then be taken up by politicians and the public sector. To achieve this, technical spatial amounts of the environment need to be defined by experts for understanding. Links are made through science between NGOs and the public sector. Both NGOs and the pubic sector are keen to make links to science.

6.3.5 Knowledge management.

By examining knowledge management in successful case studies it was found that networking, creating flows of information from overseas and devising means of presenting information in ways that the public can relate to were important. As discussed earlier in this chapter, emphasis on scientific information was high, with use of data and individuals. Level 4 suggests a way forward is to commence to involve experts, group discussions and checks to see that the scientific data available has been included. Level 1 aims to create knowledge flows that generate further knowledge from overseas links and the scientific community.

6.5 Conclusion

The introduction to this thesis noted that coastal management has been a long term and increasingly salient policy issue in Australia. This issue has been the focus of considerable attention from all levels of government and non-governmental organisations, but this thesis was premised on the key point that despite this work degradation of coast still persists. In adopting an explicit focus on environmental governance this research has explored key coastal issues in Victoria, and then extended these results for broader application by developing a generalize checklist and considering priority actions.

Environmental governance has been a very useful tool to explore this problem and with the added emphasis on performance and environmental outcomes, has identified five criteria that have relevance. Two of these criteria would not have been identified without the wider non-government view. The case studies over long periods of time showed that it was not only the criteria at the macro level that were important to achieve environmental goals. Each criterion had more depth and fine-tuning in what was important for success. These factors have been put together in a checklist for coasts to assist in environmental goals for coasts.

There has been a call for an increase in governance research as it relates to the coast (State of the Environment Report 2011, 873). In addition to this, the existing governance for biodiversity conservation and sustainability is recorded as presently

non-effective in the Millennium Ecosystem Assessment report in 2005. Further research is required designing governance effective approaches to support biodiversity. The approaches that have been used in many parts of the world, such as decentralization of biodiversity management, have had variable results (Millennium Ecosystem Assessment 2005, 124).

Researchers have noted that the lack of a framework for environmental governance has proved limiting (see Galaz et al. 2012, Bernauer and Gampfer 2013). Dale et al (2013) makes the point that there is not the framework to allow environmental governance in the world to take advantage of carbon advantages. Driessen et al 2012 found that a clear conceptual framework to differentiate between modes of environmental governance is lacking. Further after the development and application of a framework they found "application of our framework leads to detailed, replicable and comparable claims about character and intensity of shifts in environmental governance" (Driessen et al 2012). This thesis does provide a framework that links communities, practitioners and scientists and where it is possible to note the contributions of each. This reflects insights from Galaz et al. (2012) who investigated the environmental governance of the spatial boundaries of planetary earth, focusing on the problems of governance that combines ecosystem stewardship with social-ecological systems, and links communities, practitioners and scientists (Galaz et al 2012).

It has been claimed that globalization has caused a new type of accountability and questioned if this will this be actors or organisations that are accountable (Mulgan 2000,Sullivan and Taylor 2006). Future research in environmental governance will need to allow for this accountability and provide structures for this. Increasingly this calls for overall goals and flexibility, and processes to oversight progress on addressing environmental goals.

The framework established in this thesis has the potential to improve environmental governance by giving further focus on the achievement of environmental goals and simplifying the complexity of environmental problems that many researchers have referred to. The research agenda for the next decade will need to include cross-disciplinary problems that encompass ecology, management and governance. More

information is required on the workings of environmental governance under different pressures. Society relies on the environment, especially the coastal environment, for many needs and has a priority to further understand the contributions to meeting environmental goals.

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Appendix 1

Survey- Environmental Governance of Australia's Coasts

1. What do you think about the clarity of environmental objectives in the program/programs we are talking about?

2. Has this program met its stated environmental objectives? What other environmental things have been achieved by this program?

3. Can you tell me anything about an **identifiable spatial component** of coastal/freshwater habitat that could be assigned as use by the environment?
    a. What information supports the identification of this spatial component?
    b. What would a spatial component look like?
    c. Is this spatial component something that a community group could defend?
    d. What else about this concept would you like to tell me about?

4. What scientific techniques have been the most successful in establishing ecological techniques that have been translated into policy/programs?

5. Does the program have any **threshold or feedback loops** linked to legislation? What problems or issues do you see arising from threshold or feedback loops linked to legislation?

6. Can you tell me anything about environmental **advocacy** for this program? What groups are interested in environmental advocacy for this program?

    SHOW THEM SOME OF THE THINGS ABOUT THIS PROJECT

7. Has this project changed any of your thoughts about the way that environmental governance might be approached if you were a community environmental group/interested in the environment?

8. In addition to what we have already talked about, what else would need to happen or needs to happen to get more of our ecosystems and diversity continuing to exist for coasts/freshwater?

9. How is information on the environment for coasts/freshwater passed onto groups, scientists, planners and others? What workshops or information exchanges exist?

Background Questions- Environmental Governance

1. Is there anything else that influenced the success of these conservation programs more than the factors that we have already spoken about? What else can you tell me about the success of state conservation programs in the 1980s and 1990s?

    a. How do you feel the background factors operating in the state at the time affected the conservation programs in the state?
    b. Do you think the things we have spoken about are the major factors?

2. What can you tell me about the influence and assistance of related Commonwealth programs and how this was played out in the states (Victoria/ NSW).

    a. Prompt: (What commonwealth programs do you know about that were operating at that time?)
    b. What do you know about the role of the Natural Resources Ministerial Council at that time and its effect on conservation programs?
    c. Where there any other Ministerial Councils operating in the area at the time that you consider are important?

3. What can you tell me about the influence of the political party of the day on conservation programs for coasts, wetlands and environmental flows?

4. What can you tell me about public land assessment related to conservation of coasts (insert which programs this person is an expert in)?

    Is there anything to add to this story from the state of the environment reporting in Victoria/NSW?

5. Tell me about auditing and assessment of conservation of coasts (insert name of conservation program that they are familiar with).
    a. What monitoring do you know of that has been achieved for conservation of coasts (insert relevant environment?
    b. In addition to everything we talked about in an ideal world what parameters could you use to establish feedback loops for the coastal (insert relevant habitat) conservation program.

6. Tell me what you know about the amount of funding allocated to the coastal conservation program in the 1980s and 1990s by state government? Prompt: (What would be the approximate amount allocated in S10,000 per year?)

7. If you were given the opportunity to talk to the government of the day at that time what would you tell them about how to make a successful conservation program for coasts (insert type of conservation program)?

8. What about the pressures on coastal habitat in the 1980s and 1990s then compared to now- what were the pressures more or less compared to now.

9. What was the assistance from the commonwealth in the development of databases or mapping for coasts?

10. Overall what was the access to knowledge on coastal (insert relevant conservation program) conservation by stakeholders.

11. What do you know about the geographical differences of managing the conservation of ----between states?

12. What about the influence of local government on the conservation of coasts in the 1980s and 1990s?

Appendix 2

Interviewees

Case Study	Position
Environmental water	Senior Public servant
Environmental water	Head of Agency
Environmental water	Senior technical specialist
Environmental water	Senior technical specialist
Environmental water	Public servant
Environmental water	Scientist
Environmental water	Head of Agency
Environmental water	Public servant
Environmental water	Scientist
Environmental water	Retired Head of Agency
Wetlands	Public servant
Wetlands	Previous Head of Agency and Academic
Wetlands	Public servant
Wetlands	Public servant
Wetlands	Scientist
Wetlands	Public servant
Wetlands	Head of Agency
Marine Protected Area/ Coasts	Public servant
Marine Protected Area/ Coasts	Senior Public servant
Marine Protected Area/ Coasts	Public Servant
Marine Protected Area/ Coasts	Head of Agency
Marine Protected Area/ Coasts	Academic
Marine Protected Area/ Coasts	Academic
Marine Protected Area/ Coasts	Public servant and advocate
Marine Protected Area/ Coasts	Advocate
Marine Protected Area/ Coasts	Public servant